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Endogenous Capacity, Multiple Equilibria and Thirlwall's Law: Theory and an Empirical Application to Mexico: 1950 - 2012.

Juan Alberto Vázquez Muñoz
University of Massachusetts - Amherst

ENDOGENOUS CAPACITY, MULTIPLE EQUILIBRIA AND THIRLWALL'S LAW: THEORY AND AN EMPIRICAL APPLICATION TO MEXICO, 1950 – 2012

A Dissertation Presented

by

JUAN ALBERTO VÁZQUEZ MUÑOZ

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Approved as to style and content by:

_____
J. Mohan Rao, Chair

_____
Mwangi wa Gĩthĩnji, Member

_____
Shouvik Chakraborty, Member

_____
Michael Ash, Department Chair
Department of Economics

DEDICATION

To Miguel and Modesta.

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ABSTRACT

ENDOGENOUS CAPACITY, MULTIPLE EQUILIBRIA AND THIRLWALL'S LAW: THEORY AND AN EMPIRICAL APPLICATION TO MEXICO, 1950 – 2012

MAY 2016

JUAN ALBERTO VÁZQUEZ MUÑOZ, B.A., BENEMÉRITA UNIVERSIDAD AUTÓNOMA DE PUEBLA

M.A., UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO

Ph.D., UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor J. Mohan Rao

This dissertation incorporates the investment variable in two alternative post-Keynesian theories, Thirlwall's Law and The Endogeneity of the Natural Rate of Growth, and then uses them in order to explain the performance of the rate of growth of the Mexican economy during the 1950 – 2012 period.

In chapter two we elaborate an extension of the Thirlwall's Law model in which exports are not the only source of growth but so is investment. The demand for imports is affected in a negative way when capital accumulation alters the internal structure of economic production to substitute for imports. Then, the rate of growth consistent with a constant trade balance can be increased via raising investment as a share of the GDP.

In chapter three we analyze some empirical applications of Thirlwall's Law and then we highlight some problems with respect of the omission of the investment variable in the determination of the income elasticity of demand for imports. Then we apply our modified model of the Thirlwall's Law for the Mexican case for the period 1951 – 2012

to show that the Mexican rate of growth consistent with a constant trade balance was strongly affected by the investment share of the GDP.

In chapter four we analyze the determination of the natural rate of growth of the Mexican economy. We show that the Mexican natural rate of growth is endogenous to the effective rate of growth, but we also show that the different growth regimes, depressive, normal and expansive, are endogeneous to the investment share of the GDP.

Finally, in chapter five we discuss some of the determinants of the investment share of the GDP in the Mexican case. We indicate that a mix of conservative economic policies, the economic liberalization process followed from the mid-eighties and the elimination of the industrialization policy caused a decrease in the rate of investment and a change in its composition that in consequence produced a decrease of both the rate of growth consistent with a constant trade balance and the natural rate of growth.

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INTRODUCTION

The Mexican Economy exhibited an outstanding rate of economic growth from 1951 to 1981, 6.61% on average per year; however, the Debt Crisis of 1982 gave place to a seven year period in which the annual average of the rate of growth was just 0.10%; then from 1989 to 2012 its annual average was 2.94%. What is behind the strong reduction of the Mexican rate of growth? The general objective of this dissertation is to incorporate the investment share of the GDP in two alternative post-Keynesian theories, Thirlwall's Law and The endogeneity of the Natural rate of growth and then to use them in order to give an answer to our previous question.

According to Thirlwall (1979), the main constraint on the economic growth is the Balance of Payments restriction. In the simplest version of Thirlwall's law, the long-run rate of growth of the economies is equal to the ratio rate of growth of exports to income elasticity of demand for imports. A theoretical aspect of the Thirlwall´s model has to do with its stability properties, for Pugno (1998) the long-run rate of growth derived from that model is a steady state, but the original theoretical specification failed because did not provide the necessary requirements in order to stabilize the long-run rate of growth. Pugno (1998) tried to solve this deficiency, but he failed because he determined the long run stability of the rate of growth given by the ratio rate of growth of exports to income elasticity of demand for imports, and in fact, this ratio does not imply a steady state, or at least not always, because GDP and exports are growing at different rates except when the income elasticity of demand for imports is equal to one. But we think that the economies, especially developing ones, are in a continuous transition process the aggregate demand is endogenously changing and that the relevant question is how the capital accumulation

could affect it. So, in chapter 1 we introduce the investment variable in the Thirlwall's model by using the Harrodian idea about the double effect of the investment, as aggregate demand source and as a generator of economic capacity. The economy would produce some goods that otherwise have to be imported through the generation of economic capacity and then even although the income elasticity of demand for imports would be higher than one the composition of the aggregate demand could be stabilized, although we do not imply any kind of rules to get a permanent stabilization because we cannot truly know the "optimality" or "sub-optimality" of a particular composition of the economy. Moreover, it is shown that the investment, and not only exports, is also important in order to relax the external restriction to grow.

Then, in chapter 2 we analyze some empirical papers in which authors have applied the Thirlwall's law model in order to give an explanation of the performance of the rate of growth of many countries. According to our analysis, we think that there is a general problem: whilst it is true that countries cannot growth by accumulating deficits/surpluses of their trade balance, if the incorporation of the supply side of the economy through the incorporation of the economic capacity and then through the incorporation of the investment coefficient in the import demand function is necessary, then the estimations done so far have an omitted variable problem and although the rate of growth consistent whit trade balance equilibrium would be a good approximation of the effective rate of growth, the income elasticity of demand for imports estimated would not be unbiased. On the other hand, we will see that usually the income elasticities of demand for imports estimated are higher than one, but in contrast it is not usual to find economies in which their internal demand for domestic goods or their external demand

are being eliminated at all and we think that this is due to the role of the economic capacity. It means that the composition of the aggregate demand can be modified in an endogenous way given the value of the income elasticities of demand for imports and the investment share of the GDP or as a result of a change, driven through economic policy tools[1], of the investment share of the GDP and then of the economic capacity of the economies. Moreover, the validation of the estimated rates of growth consistent with a constant trade balance position has been done by applying some kind of statistical methodology in which the observed rate of growth and the estimated rate of growth are compared but we think that it is more important to check what is happening with the trade balance positions of the countries during the period analyzed. So, in chapter 3 we apply the modified Thirlwall's law model presented in chapter two in order to evaluate the role of the capital accumulation in the economic performance of the Mexican economy during the period 1951 – 2012.

Another important issue besides the rate of growth consistent with a constant trade balance position is the natural rate of growth, which in this dissertation, and according to some interpretations, is considered the rate of growth necessary in order to maintain a constant unemployment rate.

León-Ledesma and Thirwall (1998) postulated, in opposition of the general consensus, that the natural rate of growth is endogenous to the rate of growth itself through the endogeneity of both of its components, the rate of growth of population (employment) and the rate of growth of the labor productivity. For us, it is very important to specify that Harrod (1939) used the rate of growth of the population as a component of

[1] Therefore the economic policy is simultaneously exogenous, being a policy, and endogenous, being a response to endogenously varying conditions.

the natural rate of growth whilst León-Ledesma and Thirlwall (1998) used the rate of growth of the employment because whilst it is true that in the context of a constant unemployment rate, it could be irrelevant to use a distinction of the rate of growth of the population, and the rate of growth of the employment, we think that this distinction is very important especially in economies with unlimited supply of labor, in which in the extreme the rate of growth of the population could be constant and anyway the natural rate of growth, taking as reference to the rate of growth of the employment, could be positive.

We consider that the idea of the endogeneity of the natural rate of growth to the rate of growth itself is very interesting because in effect it could be an evidence of the effective demand problems of the economies. But we think that in the context of economies with unlimited supply of labor, the normal natural rate of growth itself is endogenous and the same can be said for the expansive natural rate of growth. Both of them, and even a third one that we call the depressive natural rate of growth, are endogenous to the capital accumulation and then to the investment coefficient of the economies. So, if the natural rate of growth is composed by the rate of growth of the employment and the rate of growth of the labor productivity, if there is no capital accumulation and there is not an increase of the labor productivity, the normal natural rate of growth could be equal to zero whereas if the natural rate is composed of productivity growth and population growth, then, the natural rate could not fall to zero. So, in chapter 3 we show that in the context of economies with unlimited supply of labor, as usually the developing economies are, the depressive, normal and expansive natural rates of growth are endogenous to the investment coefficient of the economies and

specifically to the rate of growth of the economic capacity, whilst the expansive and depressive natural rates of growth are also endogenous to the utilization coefficient of the economic capacity of the economies. Beside it, we develop a new way to estimate the normal, natural and depressive natural rates of growth that takes into account the utilization coefficient of the economic capacity of the economies and we apply our methodology in order to estimate the depressive, normal and expansive natural rates of growth of Mexico for the period 1974 – 2012.

In chapter 4 our objective is to identify some of the factors behind the reduction of the investment coefficient of the Mexican economy after the Debt Crisis of 1982 and to use our previous theoretical developments in order to evaluate the importance of the economic policy in the occurrence of this phenomenon and to give some brief recommendations of economic policy. We develop our analysis in the context of the economic liberalization process embraced by the economies of Latin America after the mid-1980s.

CHAPTER 1

ECONOMIC CAPACITY, CAPITAL ACUMULATION AND THIRLWALL'S LAW

1.1 Introduction

According to Thirlwall (1979), the main constraint on the economic growth is the Balance of Payments restriction; in the simplest version of Thirlwall's law, the long run rate of growth of the economies is equal to the ratio rate of growth of exports to income elasticity of demand for imports. Therefore, exports are a key element because they relax the external restriction on the economic growth. From 1979, year of the publication of the seminal paper "The Balance of Payments Constraint as an Explanation of International Growth Rate Differences", there have been a lot of papers applying the Thirlwall's model in order to understand the performance of developed and developing countries and there have been also theoretical debates around the Thirlwall's Law and extensions to the model.

A theoretical aspect of the Thirlwall´s model has to do with its stability properties; for Pugno (1998) the long run rate of growth derived from that model is a steady state, but the original theoretical specification failed because did not provide the necessary requirements in order to stabilize the long run rate of growth. Pugno (1998) tried to solve this deficiency by incorporating the relative prices as an independent variable in the equations of the rates of growth of the demand for exports and for imports, and by assuming a labor supply perfectly elastic to the real wage. The problem is that Pugno (1998) could not solve the problem because he determined the long run stability of the rate of growth given by the ratio rate of growth of exports to income elasticity of demand for imports, and in fact, this ratio does not imply a steady state, or at least not always,

because GDP and exports are growing to different rates except when the income elasticity of demand for imports is equal to one; so, there is an instability problem related with the endogenous change of the composition of the aggregate demand.

With respect to another theoretical debate around the Thirlwall's Law, Palley (2003) criticized Thirlwall's model because there is not a supply side of the economy, therefore there is no way to understand the determination of the long run rate of growth because it has not just to fulfilled the external restriction requirement but also the equality between the rates of growth of demand and supply. Palley (2003) solves this deficiency incorporating the supply side of the economy through the Harrodian natural rate of growth and endogenizing the income elasticity of demand for imports to the utilization rate of the potential output. Then Setterfield (2006) argued that in fact, it is the Harrodian natural rate of growth that is endogenous to the effective rate of growth through the endogenous behavior of the Verdoorn coefficient to the utilization rate of the potential output.

So in this chapter, we show that the long run rate of growth implicated for the simplest version of the Thirlwall's model is not a steady state if the income elasticity of demand for imports is not equal to one, the problem is that in the very long run the external restriction is not important if the income elasticity of demand for imports is lower than one; or the economy will be producing just for the external market if the income elasticity of demand for imports is higher than one because the composition of the aggregate demand between internal demand and exports will be changing endogenously over the time in favor of the exports, something that is not plausible in the real world. Notice, however, that for us, the real problem that is derived for the simplest

version of Thirlwall's model is not that the long run rate of growth implicated by the model appears hand in hand with an endogenous change of the composition of the aggregate demand but that the model predicts implausible corner equilibriums. Then we introduce the investment variable in the Thirlwall's model by using the Harrodian idea about the double effect of the investment, as aggregate demand source and as a generator of economic capacity. The economy would produce some goods that otherwise have to be imported through the generation of economic capacity, and then even although the income elasticity of demand for imports would be higher than one the composition of the aggregate demand could be stabilized. We do not imply any kind of rules to get a permanent stabilization because we cannot truly know the "optimality" or "sub-optimality" of a particular composition of the economy. It is interesting that Thirlwall (2011) indicated that his model is a Harrodian model[2], but as it is indicated by Moudud (2000) for Harrod the key variable in the determination of the rate of growth is the investment. Maybe the difference has to do with the fact that for Thirlwall (1979) the external restriction appears before the economy has achieved the full utilization capacity, but the point is that investment has not role in Thirlwall's model. So, we focus on the role of the economic capacity generated by the capital accumulation and its effect in the determination of the rate of growth consistent with a constant trade balance.

This chapter is divided in four sections including this introduction; in section two we present a theoretical literature review about Thirlwall's model; in section three we present an extension that incorporates the supply side of the economy through the

[2] Thirwall (1979) wrote that with respect to his model "…Charles Kennedy (who had been a friend of Roy Harrod in Oxford for many years)… …said… …that this looks like a dynamic version of Harrod's static foreign trade multiplier." (Thirlwall 2011: 323).

economic capacity generated by capital accumulation; and finally in section four we present our final remarks.

1.2 Thirlwall's law: theoretical literature review.

1.2.1 Thirlwall's law.

Thirlwall's law can be derived in the next way: suppose that the demand for exports and imports can be expressed as:

$$X = \theta^{\varepsilon x}(Y^*)^{\psi^*} \qquad (1.1)$$

$$M = \theta^{-\varepsilon m} Y^{\psi} \qquad (1.2)$$

where X and M are export and import levels measured in domestic output, θ is the real exchange rate, εx and εm are the real exchange rate elasticities of demand for exports and imports, Y^* and Y are foreign and national income, and ψ^* and ψ are the income elasticities of demand for exports and imports. Taking rates of growth of equations (1.1) and (1.2) we can get the rates of growth of exports and imports:

$$x = \varepsilon x\hat{\theta} + \psi^* g^* \qquad (1.3)$$

$$m = -\varepsilon m\hat{\theta} + \psi g \qquad (1.4)$$

where x and m are the growth rates of exports and imports respectively, $\hat{\theta}$ is the rate of growth of the real exchange rate, and g^* and g are the growth rates of foreign income and national income respectively. The static equilibrium condition of the trade balance is:

$$X = \theta M \qquad (1.5)$$

Taking rates of growth of the equation (1.5) we can get the dynamic equilibrium condition of the trade balance:

$$x = \hat{\theta} + m \qquad (1.6)$$

Substituting equations (1.3) and (1.4) in (1.6) and solving for g we can get the rate of growth consistent with trade balance equilibrium (g_{tb}^2):

$$g_{tb}^2 = \frac{(\varepsilon x + \varepsilon m - 1)\hat{\theta} + \psi * g^*}{\psi} \qquad (1.7)$$

As it can be seen from equation (1.7) if the Marshall – Lerner condition is fulfilled, i.e. if $\varepsilon x + \varepsilon m > 1$ in absolute value, a depreciation of the real exchange rate increases the rate of growth consistent with trade balance equilibrium; moreover, g_{tb}^2 exhibits a positive relationship with the rate of growth of the external income and with the income elasticity of demand for exports, and a negative one with the income elasticity of demand for imports.

On the other hand, Thirlwall (1979) indicates that export and import prices measured in a common currency tend to vary very little over the time and that empirically the sum of the price elasticities of demand for exports and imports tend to be near to one[3]:

> "Many models… …, and the empirical evidence, suggest that over the long period there can be little movement in relative international prices measured in a common currency, either because of arbitrage (the law of one price) or because exchange depreciation forces up domestic prices equiproportionately so that in the long run $(p_{dt} - p_{ft} - e_t) \approx 0$." (Thirlwall 1979: 50).

Where p_{dt}, p_{ft} and e_t are the domestic inflation rate, the external inflation rate and the rate of change of the nominal exchange rate respectively. It is important to note that according to McGregor and Swales (1985) the law of one price "…implies that for a small country the price elasticities of demand for exports are infinite and so growth cannot be balance-of-payments constrained." (McCombie 2011: 358).

However McCombie (2011) pointed fourth points in order to rehabilitate the Thirlwall's Law: 1) It has been found in many empirical studies in which relative prices shown significant variations that the estimated real exchange rate elasticities of demand for exports and of demand for imports just met the Marshall-Lerner condition, and therefore even huge variations of the relative prices cannot have a significant effect on the trade balance. 2) Real wage resistance and oligopolistic pricing can be another reason

[3] Notice that this assumption is not consistent with the Prebisch-Singer hypothesis for which the terms of trade are endogenous to the rate of growth differences between developed and developing countries. Also, it is important to stress that the Prebisch-Singer hypothesis was making reference not to nations as unit of analysis, but to entire regions in a bipolar world, North and South, developed and developing countries.

that explains why prices do not greatly change. 3) If relative prices were so important then the world income elasticity of demand for exports should be small and insignificant and that is not the case. 4) As it was mentioned previously, even if the Marshall-Lerner condition is fulfilled a depreciation of the real exchange rate just have a temporal effect in the long run rate of growth, but in order to produce a permanent effect it has to be depreciated continuously which is implausible.

So, assuming that the real exchange rate is constant and/or that the sum of the real exchange rate elasticities of demand for imports and of demand for exports is equal to one, we can express the equation (1.7) as the strong version of the Thirlwall's law:

$$g_{tb}^{1} = \frac{\psi * g *}{\psi} \qquad (1.8)$$

And because the numerator of equation (1.8) shows the rate of growth of exports we can just substitute x instead of $\psi * g *$ in order to get the "weak" version of the Thirlwall's Law[4]:

$$g_{tb} = \frac{x}{\psi} \qquad (1.9)$$

Then, the Harrod dynamic multiplier is equal to:

[4] The difference between the "strong" and the "weak" version of the Thirlwall's Law is an empirical matter, if Thirlwall's Law is applied without the estimation of $\psi *$ through the dynamic version of equation (2) then we obtain the "weak" version because x is including the effect of the rate of change of θ and also that of $g*$ (see Perraton 2003).

$$m_{gtbx} = \frac{1}{\psi} \qquad (1.10)$$

Equation (1.9) gives us the Thirlwall's Law and its implications of economic policy; in order to generate a higher rate of growth, the economies have to increase their rate of growth of exports (x) and/or reduce their income elasticity of demand for imports (ψ).

1.2.2 Pugno's conditions for the stability of the Thirlwall's law.

Pugno (1998) indicated the necessary theoretical conditions for which equation (1.8) will become a steady state because according to him:

> "… neither the original model nor its subsequent developments spell out the underlying structure necessary to explain dynamic stability. Thirlwall's model in fact provides only a steady-state solution, where all the variables grow at the same constant rate. Most important, the model predicts a steady growth disregarding both the *size*, rather than the changes, in the deficit or surplus of the balance of payments, and the gap in the levels, rather in the changes, of domestic and foreign competitive prices. Hence the model fails to explain the working of the external constraint on economic growth." (Pugno 1998: 559 – 560).

The stability of equation (2.8) depends on two necessary conditions: that real wages grow at the same rate as labor productivity does, and that export prices grow at the same rate as foreign prices do. Pugno (1998) showed it by incorporating the level of relative competitiveness in the equations of the rate of growth of the demand for exports

and imports, and by allowing for a log run flexibility of labor supply in Thirlwall's model, or more specifically "…by introducing the following assumption: Growth in the labor supply will rise or fall depending on a rise or fall in real wages with respect to productivity, in the long run." (Pugno 1998: 569). So, Pugno (1998) developed a model in which the Harrodian natural rate of growth, or more specifically, the rate of growth of the employment is endogeneized to the rate of growth of the strong version of the Thirlwall's law (equation (1.8)). If g_{tb}^{1} is higher/lower than the Harrodian natural rate of growth, the rate of growth of the real wages is higher/lower than the rate of growth of the labor productivity, and then the rate of growth of the employment is increased/decreased to the point in which g_{tb}^{1} is equalized to the Harrodian natural rate of growth.

1.2.3 Nell's generalization of Thirlwall's Law.

Nell (2003) modifies equations (1.3) and (1.4) by disaggregating the rate of growth of the external income (g_i^*), taking into account the different income elasticities of demand for exports and imports to and from each trading partner (ψ_i^* and ψ_i), and the corresponding percentages of the total exports (φ_i^*) and imports (φ_i) to and from each trading partner:

$$x = \varepsilon x \hat{\theta} + \sum_{i=1}^{n} \psi_i^* \varphi_i^* g_i^* \qquad (1.11)$$

$$m = -\varepsilon m \hat{\theta} + \sum_{i=1}^{n} \psi_i \varphi_i g \qquad (1.12)$$

Substituting equations (1.11) and (1.12) in (1.6) and solving for g we can get the rate of growth consistent with trade balance equilibrium of the generalized model (g_{tb}^{N}):

$$g_{tb}^{N} = \frac{(\varepsilon x + \varepsilon m - 1)\hat{\theta} + \sum_{i=1}^{n} \psi_i^* \varphi_i^* g_i^*}{\sum_{i=1}^{n} \psi_i \varphi_i} \qquad (1.13)$$

Nell (2003) himself indicates that, assuming that the real exchange rate is constant and/or that the sum of the real exchange rate elasticities of demand for imports and for exports is equal to one, we can write equation (1.13) more compactly as equation (1.8). So, the main contribution of Nell (2003) is that countries have to identify the specific income elasticities of demand for exports and imports to and from their trade partners in order to elaborate trade policies that improve their collocation of exports in the most dynamic external markets.

1.2.4 Araujo and Lima's generalization of Thirlwall's law.

In contrast with Nell's generalization of the Thirlwall's model, we find the generalization of the Thirlwall's model proposed by Araujo and Lima (2007) who, by using a Pasinettian multi-sector macrodynamic framework, showed that, assuming that the real exchange rate is constant and/or that the sum of the real exchange rate elasticities of demand for imports and for exports is equal to one, equation (1.8) can be re-expressed as:

$$g_{tb}^{AL} = \frac{\sum_{i=1}^{n} \gamma_i^* \psi_i^* g^*}{\sum_{i=1}^{n} \gamma_i \psi_i} \qquad (1.14)$$

where γ_i^* and γ_i are the shares of the exports and imports of the industry *i* in total exports and imports; and ψ_i^* and ψ_i are the income elasticities of demand for exports and imports of industry *i*. So, the main contribution of Araujo and Lima (2007) is, as described by Thirlwall (2011) that they showed that:

> "…even if sectorial elasticities are constant and there is no change in world income growth, a country can grow faster by shifting resources to sectors with higher income elasticities of demand for exports and away from sectors with a high income elasticity of demand for imports. This is what import substitution and export promotion policies are meant to achieve. …From a policy point of view, this multi-sectoral specification of the model allows for the identification of key, strategic, growth-promoting tradable-goods sectors of the economy." (Thirlwall 2011: 331).

1.2.5 Thirlwall's law and the Hicks super-multiplier.

According to McCombie (1985) and Thirlwall (2011), exports, as a component of demand, are unique because they allow to others autonomous components of demand to grow without worsen the trade balance.

We can describe a simple orthodox Keynesian model as:

$$Y = C + X - M \qquad (1.15)$$

$$C = \overline{C} + \bar{c}Y \qquad (1.16)$$

$$X = \overline{X} \qquad (1.17)$$

$$M = \overline{M} + \overline{m}Y \qquad (1.18)$$

where C is the consumption level, $\overline{C}$ is the autonomous consumption level, $\bar{c}$ is the marginal propensity to consume, $\overline{X}$ is the autonomous level of exports, $\overline{M}$ is the autonomous level of imports, $\overline{m}$ is the marginal propensity to import, and $0 < \overline{m} < \bar{c} < 1$. In equilibrium, the level of income is given by:

$$Y = \frac{1}{1 - \bar{c} + \overline{m}}[\overline{E} + \overline{X}] \qquad (1.19)$$

where $\overline{E}$ is equal to the autonomous level of consumption minus the autonomous level of imports. Given the equation (1.19), we can express the rate of growth of the income as:

$$g = \frac{1}{1 - \bar{c} + \overline{m}}[a_E \hat{\overline{E}} + a_X x] \qquad (1.20)$$

where a_E is the ratio $\overline{E}/Y$, $\hat{\overline{E}}$ is the rate of growth of the autonomous demand without exports, and a_X is the ratio $\overline{X}/Y$. Now, given a trade balance equilibrium, if exports are constant and $\overline{C}$ is increased the trade balance will be worsened; but on the other hand, given a trade balance equilibrium, if exports are increased it will allow an increase of $\overline{C}$. It can be shown in the next way, trade balance equilibrium implies:

$$\bar{X} = \bar{M} + \bar{m}Y \qquad (1.21)$$

so, the income level consistent with trade balance equilibrium is:

$$Y_{tb} = \frac{1}{\bar{m}}[\bar{X} - \bar{M}] \qquad (1.22)$$

and therefore, assuming a constant rate of growth of exports (*x*), the rate of growth of the income consistent with trade balance equilibrium is given by:

$$g_{tb} = \frac{1}{\bar{m}} a_X x = \frac{x}{\psi} \qquad (1.23)$$

Equalizing equations (1.20) and (1.23) and solving for $\hat{\bar{E}}$ we can find the rate of growth of the autonomous demand without exports consistent with trade balance equilibrium:

$$\hat{\bar{E}}_{tb} = (1 - \bar{c} + \bar{m})\left[\frac{1}{m} - \frac{1}{1 - \bar{c} + \bar{m}}\right]\frac{a_X}{a_E} x \qquad (1.24)$$

given that $0 < \bar{m} < \bar{c} < 1$, $\hat{\bar{E}}_{tb}$ is always a positive value for positive values of *x*. So, according to McCombie (1985), equations (1.23) and (1.24) represent the working of the Hicks' super-multiplier; as it was indicated, it means that the increase of the exports does not just to produce an increase of the income but also to allow an increase of the other autonomous components of the aggregate demand.

1.2.6 Palley's critique and Setterfield's response.

Without any reference to Pugno (1998), Palley (2003) indicates that in the same way as the neoclassical approach dismisses the importance of the demand side in the growth process "…the Keynesian paradigm has failed to account properly for the supply side." (Palley 2003: 75).

The Thirlwall's law is not an exception to this omission, so Palley (2003) postulates a balance of payments constrained growth model in which a supply side is introduced through a Verdoorn Law equation. The general idea is that in the long run, the rate of growth is not just constrained by the balance of payments equilibrium requirement, but also by the equality between the rates of growth of the output and of the potential output.

Palley's model can be expressed in the next way:

$$x = \psi * g * \qquad (1.25)$$

$$m = \psi g \;\; m = \psi g \qquad (1.26)$$

$$x = m \qquad (1.27)$$

$$a = \lambda_0 + \lambda_1 g \qquad (1.28)$$

$$g^s = a + n \qquad (1.29)$$

where equation (1.28) is the Verdoorn Law equation, a is the rate of growth of the labor productivity, λ_0 is the autonomous rate of growth of the labor productivity, λ_1 is the Verdoorn coefficient, g^s is the rate of growth of the potential output, and n is the rate of

growth of the labor force. The problem of the model is that it is over-determined, as it can be shown, the solutions for g and g^s are:

$$g = \frac{\psi^*}{\psi} g^* \qquad (1.30)$$

and

$$g^s = \lambda_0 + \lambda_1 \frac{\psi^*}{\psi} g^* + n \qquad (1.31)$$

so, just by coincidence g^s and g will be equal; in such a case g^* has to have a specific value determined by the parameters of the model:

$$g^* = \frac{\lambda_0 + n}{[1 - \lambda_1]\frac{\psi^*}{\psi}} \qquad (1.32)$$

If g^* is higher/lower than the specific value given by equation (1.32) g^d is higher/lower than g^s, and therefor there is a growing excess of demand or a growing excess of capacity. Palley (2003) solves this over-determination problem by endogenizing the income elasticity of demand for imports:

$$\psi = f\left(\frac{Y}{Y^s}\right), \qquad f' > 0 \qquad (1.33)$$

so, the income elasticity of demand for imports is a positive function of the utilization rate of the potential output. According to Palley (2003): "A rationale for this is that imports are driven by bottlenecks. As the rate of excess capacity and unemployment decrease, bottlenecks become more prevalent and the share of increments in income spent on imports increases." (Palley 2003: 80).

Given that g^s and g^d are equal if:

$$g = g^s = \frac{\lambda_0 + n}{1 - \lambda_1} \qquad (1.34)$$

if g^s is higher/lower than g then Y/Y^s is decreasing/increasing, ψ is decreasing/increasing and therefore g is increasing/decreasing, and the process is stopped when g equalizes g^s.

Setterfield (2006) criticized Palley's idea by indicating that with his solution:

> "We have thus arrived to a model of *quasi-supply-determined growth*, in which the reconciliation of the actual and potential growth rates is achieved wholly by means of adjustments to the rate of growth of demand: the supply side 'rules the roost'." (Setterfield 2006: 53).

Based on Thirlwall's idea about the endogeneity of the natural rate of growth, Setterfield (2006) postulates a different solution by endogeneizing the Verdoorn coefficient:

$$\lambda_1 = g\left(\frac{Y}{Y^s}\right), \qquad g' > 0 \qquad (1.35)$$

so, the Verdoorn coefficient is a positive function of the utilization rate of the potential output:

> "…firms will less likely be induced to engage in the innovation, technical change and organizational change from which productivity gains materialize by any given *rate of growth* of demand if the *level* of demand is low relative to that required for full capacity utilization. In other words, more productivity growth is induced by a goods market that is *both* tight *and* rapidly expanding." (Setterfield 2006: 54).

If g^s is higher/lower than g then Y/Y^s is decreasing/increasing, λ_1 is decreasing/increasing and therefore g^s is decreasing/increasing, and the process is stopped when g^s equalizes g.

Thirlwall (2011) indicates that:

> "In practice, both mechanisms suggested by Palley and Setterfield are likely to operate, but for a stable equilibrium they must work to reconcile the two growth rates within strict bounds because the degree of capacity utilization cannot fall below zero or exceed unity." (Thirlwall 2011: 329).

But McCombie (2011) was even further by saying that:

> "The problem with Palley's explanation is that the growth of productive potential (which it will be recalled is the growth of capacity that would have existed if there had been no balance-of-payments' constraint) has no role to play in this model, if the growth of demand is constrained by the balance of payments. There is no actual excess capacity resulting from the difference between the natural and the balance-of-payments

constrained growth rate. This is because the short side of the model (i.e. the growth of demand) is the one that determines actual growth and the natural rate remains merely a hypothetical rate." (McCombie 2011: 374).

1.2.7 Thirlwall's law and sustainable deficits.

One problem with the original Thirlwall's Law is that it does not take into account the role of the capital flows, so Thirlwall and Hussain (1982) incorporated this issue in the model; however, they did not consider that the trade balance deficits financed by capital flows cannot be higher that a certain percentage of the GDP. McCombie and Thirlwall (1997), Moreno-Brid (1998a), and Barbosa-Filho (2001) have all addressed this issue. In general, we can then modify the static equilibrium of the trade balance given by equation (1.5) in the next way:

$$X + F = \theta M \qquad (1.36)$$

where F is the trade balance deficit measure in domestic output. Taking rates of growth of the equation (1.36) and assuming that the ratio F/Y has to be constant we can get the dynamic condition for a *constant trade balance deficit*:

$$\phi x + (1-\phi) g = \hat{\theta} + m \qquad (1.37)$$

where ϕ is the initial exports to imports ratio. Substituting equations (1.3) and (1.4) in (1.37), assuming that the real exchange rate is constant and/or that the sum of the real

exchange rate elasticities of demand for imports and for exports is equal to one, using the equality $x = \psi^* g^*$ and solving for g we can get the rate of growth consistent with a constant trade balance deficit (g_{ctb}):

$$g_{ctb} = \frac{\phi x}{\psi - 1 + \phi} \qquad (1.38)$$

From equation (1.38) we can express the Harrod dynamic multiplier as:

$$m_{gctbx} = \frac{\phi}{\psi - 1 + \phi} \qquad (1.39)$$

Comparing equations (1.10) and (1.39) we can observe that the multiplier of x with respect to g_{tb} is higher than with respect to g_{ctb} if:

$$\phi < 1 \text{ and } \psi > 1 \text{ or } \phi < 1 \text{ and } \psi < 1 - \phi \text{ or } \phi > 1 \text{ and } \psi < 1$$

i.e. if the initial position of the economy is a deficit of the trade balance and the income elasticity of demand for imports is higher than one, or if the initial position of the economy is a deficit of the trade balance and the income elasticity of demand for imports is lower than $1 - \phi$[5], or if the initial position of the economy is a superavit of the trade balance and the income elasticity of demand for imports is lower than one.

The multiplier of x with respect to g_{tb} is equal than with respect to g_{ctb} if:

[5] In this case the multiplier of x with respect to g_{ctb} is negative.

$$\psi = 1$$

i.e. if the income elasticity of demand for imports is equal to one irrespective of the initial position of the trade balance[6].

So, given the fact that usually developing economies exhibit trade balance deficits and income elasticities of demand for imports higher than one, for them, usually the multiplier of x with respect to g_{ctb} is lower than with respect to g_{tb}. The trade balance deficits financed by capital flows result in a higher restriction of the rate of growth of the economy. The explanation of such situation is that given the fact that the demand for imports reacts in a stronger way to the rate of growth than the way in which the rate of growth reacts to the rate of growth of the exports, an economy has to grow even less if initially its imports level is higher than its export level and the trade balance deficit has to be constant as a percentage of the GDP.

1.3 Instability problem and the incorporation of the investment in Thirlwall's model: An extension of the model.

As it was indicated, according to Pugno (1998), Thirlwall's model "…provides only a steady state solution…" (Pugno 1998: 560) and he postulated that it is true if we assume that the Harrodian natural rate of growth is endogenized to the rate of growth consistent with trade balance equilibrium. On the other hand, McCombie (1985) and Thirlwall (2011) showed that an increase of the rate of growth of the exports does not just to allow an increase of the rate of growth consistent with trade balance equilibrium but also to

[6] My analysis about the relationship between the multipliers is not consistent with that made by Moreno-Brid (1998a); however, he did not take into account the value of the numerator of the multiplier in his comparison.

allow an increase of the other autonomous components of the aggregate demand, i. e. the idea of the Hicks super-multiplier showed in equation (1.24).

But it is not true at all that Thirlwall's model provides only a steady state solution, because this is true just in the specific case in which the income elasticity of demand for imports is equal to one; but if the income elasticity of demand for imports is different to one, the economic system exhibits an endogenous modification of the composition of the aggregate demand (see equation (1.41) below). On the other hand, and in relation with our previous statement, the problem with the idea of the Hicks super-multiplier (equation (1.24)), is that it is derived through linear equations for which the income elasticities of demand for domestic goods and for imports are endogenous to the income level and they are approaching to one with the increase of the income; moreover, the ratio M/Y has an upper limit lower than one given by $\overline{m}$:

$$\lim_{Y\to\infty} \frac{M}{Y} = \frac{\overline{M} + \overline{m}Y}{Y} = \frac{\overline{m}}{1} = \overline{m} \qquad (1.40)^7$$

So, given the fact that the ratio M/Y has a limit lower than one, it is evident that an increase of the exports allows an increase of the others autonomous components of the aggregate demand. But if we assume that $1 < \overline{c} < \overline{m}$ in such a way that even although the income demand elasticity is endogenous to the income level and tends to one when the income level tends to infinity, the ratio M/Y has an upper limit higher than one and equation (1.24) becomes negative. To assume that $1 < \overline{c} < \overline{m}$ is not unappropriated if we

[7] We are applying the L'Hôpital rule in the determination of the limit.

consider that Thirlwall's model consider the possibility of an income elasticity of demand for imports higher than one.

In effect, one implication of the equation (1.38) is that the internal structure of the economies is being modified even if the economy is growing at the value determined by g_{tb}, except when ψ is equal to 1. Using equation (1.38), the rate of growth of the ratio exports to income is equal to:

$$x - g_{ctb} = \left(\frac{\psi - 1}{\psi - 1 + \phi} \right) x \qquad (1.41)$$

From equation (1.41) it is evident that the ratio exports to income is increasing if ψ is higher than 1 or if ψ is lower than one and $\psi + \phi$ is lower than one, constant if ψ is equal to one, and decreasing if ψ is lower than one and $\psi + \phi$ is higher than one.

When the ratio exports to income tends to zero the economy has to achieve a point in which it is completely independent of the external economy and therefore the external restriction is not important anymore. On the other hand, if the ratio exports to income tends to one the economy has to achieve a point in which it is producing just for the external market and there is not internal consumption of domestic goods at all; other components of the aggregate demand, autonomous and induced are eliminated. Here we have two implications; if ψ is not modified, then the economy will accumulate persistent deficits of the trade balance because the rate of growth of the imports will be equal to the rate of growth of the exports times ψ:

$$x - m = x - \psi x = (1 - \psi) x < 0 \qquad (1.42)$$

or, as a second implication, ψ has to be modified to one in order to maintain a permanent equilibrium in the trade balance or a constant trade balance deficit, however, there is no reason in the model in order to justify endogenous variations of the income elasticity[8]. So just in the case in which ψ is equal to one the Thirlwall's law survive.

Besides the long run implications of the Thirlwall's law about the change of the internal structure of the economy, we considered that there is an implication for the economic policy of the economies; when the rate of growth is higher than g_{tb} the economies have to induce contractionary economic policies in order to generate a decrease in the rate of growth, but of course, the target is not the external demand but the internal demand.[9]

Our main idea is that exports have a double role in the determination of the trade balances of the economies; on one hand, exports have a positive direct impact because they represent income, but on the other hand, exports have an indirect negative impact on the trade balance because they generate an income that is used not just to buy in the internal market but also in order to buy imported goods. If the income elasticity of demand for imports is higher than one for the export sector, the liberalization of pressure on the trade balance given by the income generated by the exports is more than

[8] It is important to note that McCombie (2011) indicated that "The Keynesian approach is that while in the very long run the elasticities may change, in the medium term they act as a constrain." (McCombie 2011: 366), however, this is just an implicit asseveration and there is nothing in the model in order to justify endogenous variation of the income elasticity. On the other hand, as it was mentioned previously Palley (2003) introduced the idea of the endogenous income elasticity of the demand for imports in the Thirlwall's Law in order to reconcile the possible divergence between the rate of growth of the economy and the rate of growth of the capacity, however, Palley (2003) does not consider the internal structure effect that we are considering here.

[9] Notice that we are deriving a theoretical implication in a context in which the real exchange rate is not an available tool, so if the rate of growth of the economy is higher than g_{tb} the economy has to induce a reduction of the aggregate demand, exports plus internal demand, but given that the economy is exhibiting trade balance deficits the reduction of the rate of growth of the exports is not an option, the only one is the reduction of the rate of growth of the internal demand.

compensated by the pressure generated by the demand of imported goods resulted of the income generated by the exports. In order to take into account this possibility, we disaggregate the components of the income level and then we modify the equation (1.2) in the next way:

$$M = \theta^{-\varepsilon m}(DI^{\psi} + X^{\psi}) \qquad (1.43)$$

where *DI* is the income generated for the internal demand for domestic goods. Taking rates of growth of the equation (1.43) we can express the rate of growth of the imports as:

$$m = -\varepsilon m\hat{\theta} + \psi\omega di + \psi(1-\omega)x \qquad (1.44)$$

where ω is the fraction of the total imports derived of the income generated by the internal demand for domestic goods, and $(1 - \omega)$ is the fraction of the total imports derived by the income generated by the exports, and *di* is the rate of growth of the internal demand for domestic goods.

We can now express the dynamic condition of a constant trade balance deficit as:

$$\phi x + (1-\phi)(\alpha di + (1-\alpha)x) = \hat{\theta} + m \qquad (1.45)$$

where α is the ratio *DI/Y* and $1 - \alpha$ is the ratio *X/Y*. Substituting equations (1.3) and (1.44) in (1.45) and solving for *di* we can get the rate of growth of the internal demand for domestic goods consistent with a constant trade balance deficit (di^{1}_{ctb}):

$$di^{1}_{ctb} = \frac{\{[\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi](\varepsilon x + \varepsilon m - 1)\}\hat{\theta} + [\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi]\psi * g *}{\omega\psi - (1-\phi)\alpha}$$

(1.46)

As it can be seen, the first member of the numerator of equation (1.46) is a modified version of the Marshall – Lerner condition, in this version the real exchange rate elasticity of the internal demand is affected by the initial trade balance position and by the composition of the aggregate demand in such a way that even if the original Marshall – Lerner condition was fulfilled a depreciation of the real exchange rate could produce a negative effect in the trade balance position and then in the rate of growth of the internal demand consistent with a constant trade balance[10]. In the same way, the rate of growth of the external income could affect in a negative way to the rate of growth of the internal demand consistent with a constant trade balance[11].

Now, assuming that the rate of growth of the exports is given, the dynamic condition of a constant trade balance is:

$$\phi x + (1-\phi)[\alpha di + (1-\alpha)x] = \hat{\theta} + m \qquad (1.47)$$

Substituting the equation (1.44) in (1.47) and solving for the rate of growth of the internal demand consistent with a constant trade balance we get the weak version of the rate of growth of the internal demand consistent with a constant trade balance (di_{ctb}):

[10] As it can be seen, if the trade balance position is an equilibrium and if the aggregate demand is just the internal demand, i. e. if ϕ and α are equal to one, we get the original Marshall – Lerner condition.

[11] If the income elasticity of demand for imports is high, then the increase of the exports would necessitate a decrease of the internal demand in order to maintain a constant trade balance position.

$$di_{ctb} = \frac{(\varepsilon m - 1)\hat{\theta} + [\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi]x}{\omega\psi - (1-\phi)\alpha} \qquad (1.48)$$

Using the equation (1.48), the real exchange rate multiplier and the export multiplier of the internal demand consistent with a constant trade balance deficit ($m_{dictb\theta}$ and m_{dictbx}) are:

$$m_{dictb\theta} = \frac{\varepsilon m - 1}{\omega\psi - (1-\phi)\alpha} \qquad (1.49)$$

$$m_{dictbx} = \frac{[\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi]}{\omega\psi - (1-\phi)\alpha} \qquad (1.50)$$

Now, we can get the rate of growth consistent with a constant trade balance deficit as:

$$g^{*}_{ctb} = \alpha di_{ctb} + (1-\alpha)x = \left(\frac{\alpha(\varepsilon m - 1)}{\omega\psi - (1-\phi)\alpha}\right)\hat{\theta} + \left(\frac{\alpha\phi + (\omega - \alpha)\psi}{\omega\psi - (1-\phi)\alpha}\right)x \qquad (1.51)$$

Using equation (1.51) we can get the real exchange rate and the export multipliers of the national income ($m^{*}_{gctb\theta}$ and m^{*}_{gctbx}) as:

$$m^{*}_{gctb\theta} = \left(\frac{\alpha(\varepsilon m - 1)}{\omega\psi - (1-\phi)\alpha}\right) \qquad (1.52)$$

$$m^{*}_{gctbx} = \left(\frac{\alpha\phi + (\omega - \alpha)\psi}{\omega\psi - (1-\phi)\alpha} \right) \qquad (1.53)$$

The real exchange rate multiplier of the rate of growth is positive if $\varepsilon m > 1$. Moreover, comparing equations (1.39), (1.50) and (1.53) we can say that:

if $\alpha = \omega = 1$ (if there is no export sector at all):

$$m_{dictbx} = m^{*}_{gctbx} = m_{gctbx} = \frac{\phi}{\psi - (1-\phi)}$$

If $\alpha = \omega = 0.5$

$$m^{*}_{gctbx} = m_{gctbx} = \frac{\phi}{\psi - (1-\phi)}$$

and

$$m_{dictbx} = \frac{1 + \phi - \psi}{\psi - (1-\phi)}$$

and therefore m_{dictbx} is higher/equal/lower than m^{*}_{gctbx} if ψ is lower/equal/higher than one. Also, it can be shown that m_{dictbx} is higher/equal/lower than zero if ψ is lower/equal/higher than $\phi + 1$. So, it can be possible that whilst the aggregate income is growing, the internal demand for domestic goods is decreasing. This result is very

important because inside the internal demand for domestic goods we can find the demand for non-tradable goods and also because a very important determinant of the internal demand for domestic goods is the real wages[12].

Finally, if $\alpha = \omega = 0$:

$$m^{*}_{gctbx} \rightarrow \frac{\phi}{\psi - (1-\phi)}$$

and m_{dictbx} tends to infinite/one/minus infinite if ψ is lower/equal/higher than one. So, we find again that the internal demand for domestic goods tends to disappear if ψ is higher than one.

Now, it is important to note that in contrast with Palley (2003) who indicated that Thirlwall's model does not incorporate the supply side of the economy, for Bairam and Dempster (1991), McCombie (1997 and 2011), Pugno (1998), Bértola, Higachi and Porcile (2002), and Aricioglu, Ucan and Sarac (2013) the income elasticities of demand for imports and exports show the relative supply characteristics of the countries because:

> "…[their] disparities… …reflect disparities in non-price competitiveness, which are subject to very slow change. Non-price competitiveness reflects such supply-side characteristics as quality, after-sales services, the effectiveness of distribution networks, and so on. Consequently, while this approach stresses the importance of the growth of demand for exports in the process, this is a function of what may be termed a country's supply characteristics." (McCombie 1997: 346).

[12] Maybe it can be a key in order to understand the increasing inequality in developing economies and also the increasing wage gap between export firms's workers and non-tradable firm's workers.

But we think that there is a problem with this reasoning because whilst the supply characteristics are incorporated in the model, the supply quantity does not. Moreover, suppose that one economy does not produce at all the good *z* and suppose that the income elasticity of demand for good *z* is ψ^z, then the rate of growth of the imports of good *z* will be $\psi^z g$, but suppose now that at some point in the time the good *z* is produced in the economy, and even more, suppose that the production level is enough to fulfilled the internal demand, the income elasticity of demand for good *z* is still ψ^z but the rate of growth of the imports will be zero. It is important to note that even if at some point in the time a "similar" good *z* is produced in the economy, the rate of growth of the demand for imports of good *z* would not be $\psi^z g$, so the incorporation of the supply quantity could be helpful in the improvement of the estimation of the income elasticities of demand for imports.

Then, we think that it is important to incorporate the supply side of the economy in Thirlwall's model and in order to do that we use a Harrodian idea, "… by recognizing that investment has both a productive capacity-enhancing effect as well as an aggregate demand-creating one…" (Moudud 2000: 1).

Through the investment the capital stock can be modified and in line with Shaikh and Moudud (2004), through the modification of the capital stock the economic capacity can be modified:

$$CE = \sigma K \qquad (1.54)$$

where *CE* is the economic capacity level measured in domestic product, σ is the capital productivity, and *K* is the capital stock. So, assuming, for simplicity, that there is no depreciation of the capital stock, the rate of growth of *CE* can be expressed as a function of the investment coefficient of the economy:

$$ce = \hat{\sigma} + \hat{K} = \hat{\sigma} + \frac{Y}{K} \cdot \frac{I}{Y} \qquad (1.55)$$

where *ce* is the rate of growth of *CE*, $\hat{K}$ is the rate of growth of the capital stock, $\hat{\sigma}$ is the rate of growth of the capital productivity and *I* is the investment. Using equation (1.54) we can incorporate the economic capacity of the economy in the equation of the demand for imports:

$$M = \theta^{-\varepsilon m} (aK)^{\psi 2} \left(\frac{DI^{\psi} + X^{\psi}}{(aK)^{\psi}} \right) \qquad (1.56)$$

or

$$M = \theta^{-\varepsilon m} CE^{\psi 2} \left(\frac{DI^{\psi} + X^{\psi}}{CE^{\psi}} \right) \qquad (1.56')$$

where $\psi 2$ is the economic capacity elasticity of demand for imports, i.e. the capital goods imported required in order to generate the economic capacity. We assume that the equation (1.56) is multiplicative because if there is no demand at all then there is no

imports at all, and if there is no economic capacity all the absorbed goods of the economy have to be imported.

Taking rates of growth of the equation (1.56') we can express the rate of growth of the imports as:

$$m = -\varepsilon m\hat{\theta} + \psi 2\left(\hat{\sigma} + \frac{Y}{K}\frac{I}{Y}\right) + \psi\omega\left(di - \hat{\sigma} - \frac{Y}{K}\frac{I}{Y}\right) + \psi(1-\omega)\left(x - \hat{\sigma} - \frac{Y}{K}\frac{I}{Y}\right) \qquad (1.57)$$

or

$$m = -\varepsilon m\hat{\theta} + \psi 2ce + \psi\omega(di - ce) + \psi(1-\omega)(x - ce) \qquad (1.57')$$

Now, assuming that the rate of growth of the exports is given and substituting the equation (1.57) in (1.47) and solving for *di* we can get the rate of growth of the internal demand for domestic goods consistent with a constant trade balance deficit that takes into account the role of the economic capacity (di^{ce}_{dictbx}):

$$di^{ce}_{dictbx} = \frac{(\varepsilon m - 1)\hat{\theta}}{\omega\psi - (1-\phi)\alpha} + \frac{[\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi]x}{\omega\psi - (1-\phi)\alpha} + \frac{(\psi - \psi 2)}{\omega\psi - (1-\phi)\alpha}\frac{Y}{K}\frac{I}{Y} \qquad (1.58)$$

or

$$di^{ce}_{dictbx} = \frac{(\varepsilon m - 1)\hat{\theta}}{\omega\psi - (1-\phi)\alpha} + \frac{[\phi + (1-\phi)(1-\alpha) - (1-\omega)\psi]x}{\omega\psi - (1-\phi)\alpha} + \frac{(\psi - \psi 2)ce}{\omega\psi - (1-\phi)\alpha} \qquad (1.58')$$

as it can be seen from equation (1.58) the real exchange rate and the export multipliers of the internal demand are the same as those indicated in the equation (1.48) but now we also have an economic capacity multiplier of the internal demand consistent with a constant trade balance:

$$m_{dictbce} = \frac{\psi - \psi 2}{\omega\psi - (1-\phi)\alpha} \tag{1.59}$$

So, the rate of growth consistent with a constant trade balance is:

$$g^{ce}_{gctbx} = \left[\frac{\alpha(\varepsilon m - 1)}{\omega\psi - (1-\phi)\alpha}\right]\hat{\theta} + \left[\frac{\alpha\phi + \psi(\omega - \alpha)}{\omega\psi - (1-\phi)\alpha}\right]x + \left[\frac{\alpha(\psi - \psi 2)}{\omega\psi - (1-\phi)\alpha}\right]\frac{Y}{K}\frac{I}{Y} \tag{1.60}$$

or

$$g^{ce}_{gctbx} = \left[\frac{\alpha(\varepsilon m - 1)}{\omega\psi - (1-\phi)\alpha}\right]\hat{\theta} + \left[\frac{\alpha\phi + \psi(\omega - \alpha)}{\omega\psi - (1-\phi)\alpha}\right]x + \left[\frac{\alpha(\psi - \psi 2)}{\omega\psi - (1-\phi)\alpha}\right]ce \tag{1.60'}$$

Therefore the economic capacity multiplier of the national income is:

$$m_{gctbce} = \frac{\alpha(\psi - \psi 2)}{\omega\psi - (1-\phi)\alpha} \tag{1.61}$$

It can be proved that if $\alpha = \omega = 1$:

$$m_{dictbce} = m_{gctbce} = \frac{\psi - \psi 2}{\psi - (1 - \phi)}$$

if $\alpha = \omega = 0.5$:

$$m_{gctbce} = \frac{\psi - \psi 2}{\psi - (1 - \phi)}$$

and

$$m_{dictbce} = 2m_{gctbce}$$

Finally, if $\alpha = \omega = 0$:

$$m_{gctbce} \to \frac{\psi - \psi 2}{\psi - (1 - \phi)}$$

and, if $\psi > \psi 2$ and $\psi + \phi > 1$, $m_{dictbce}$ will tend to infinite.

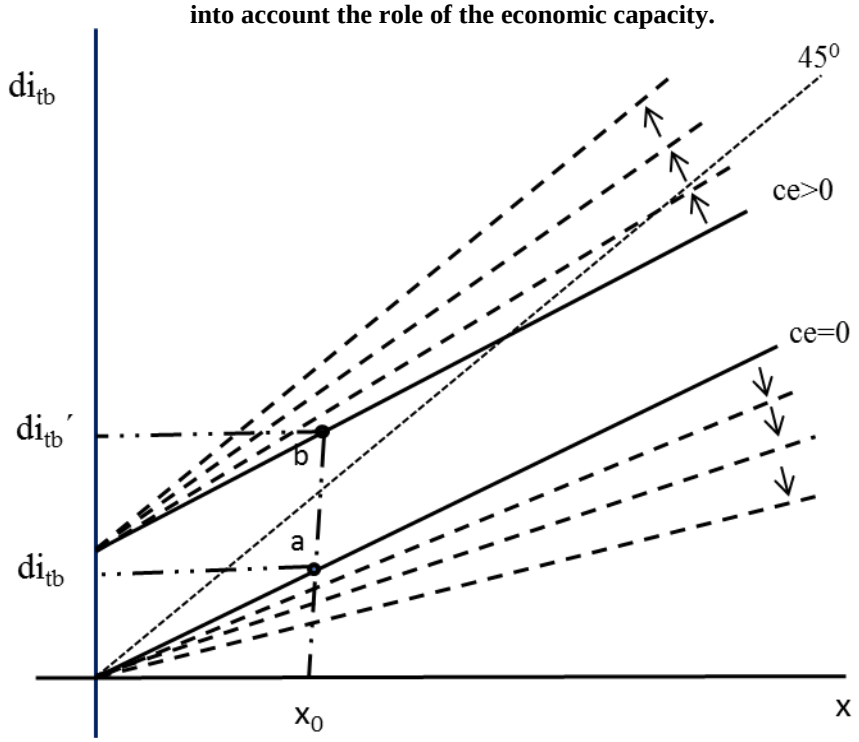
So, it is not just the exports that can help to reduce the external restriction to growth, but also the capital accumulation through the generation of the economic capacity and then through *import substitution.* As it is indicated by Lewis (1954), the capital accumulation results in reallocations of the economic resources, it shifts labor from the subsistence sector to the manufacturing sector, so in the same way the

productive structure of the economy is changed and then the kind of goods produced and demanded.

In Figures (1.1) and (1.2) we show our general idea about the importance of the rate of growth of the economic capacity. Equation (1.58') is plotted in Figure (1.1), we assume that $\hat{\theta}$ is equal to zero and therefore the intercept of the function is equal to the economic capacity multiplier of the internal demand (equation (1.59)) times the rate of growth of the economic capacity, whilst its slope is equal to the exports multiplier of the internal demand (equation (1.50)). As it can be seen, the rate of growth of the economic capacity is not just important in order to increase the rate of growth consistent with a constant trade balance position, but also it is important in the stabilization of the export multiplier of the rate of growth of the internal demand, and then in the stabilization of the composition of the aggregate demand. As it can be seen in Figure 1, if the rate of growth of the internal demand consistent with a constant trade balance determined by our extended model is lower/equal/higher than the rate of growth of the exports the export multiplier of the rate of growth of the internal demand consistent with a constant trade balance position tends to decrease/be constant/increase. On the other hand, the equation (1.60') is plotted in Figure (1.2), we assume that $\hat{\theta}$ is equal to zero and therefore the intercept of the function is equal to the economic capacity multiplier of the national income (equation (1.61)) times the rate of growth of the economic capacity, whilst its slope is equal to the exports multiplier of the national income (equation (1.53)). Given values of x, ψ and ϕ, the rate of growth consistent with a constant trade balance position is not unique because it also depends on the rate of growth of the economic capacity (see Figure 1.2).

Figure 1.1

Rate of growth of the internal demand consistent with a constant trade balance position that takes into account the role of the economic capacity.

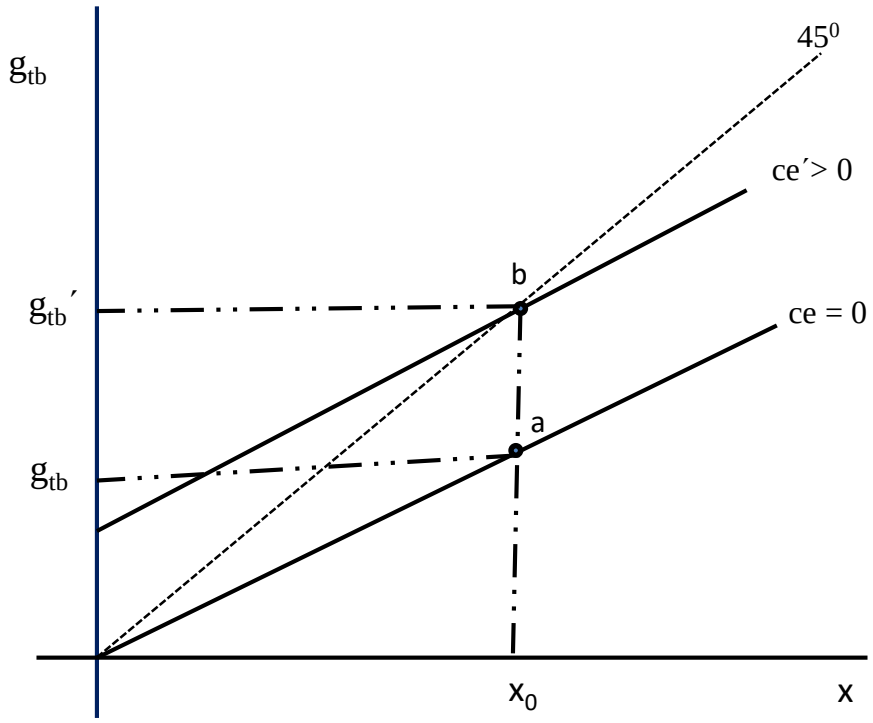


1.4 Final remarks.

Thirlwall's Law is a very influential idea about the external restriction on the growth of economies. However, Thirlwall's Law is based in the Harrodian foreign trade multiplier which was developed for Harrod under the assumption of no capital accumulation (Thirlwall, 2001) and its implication is that the long run rate of growth of the economy depends on a variable, exports, which is not fully controlled by the economy. Moreover, in the very long run, Thirlwall's Law does not survive, except when the income elasticity of demand for imports is equal to one. Otherwise, the aggregate demand of the economy is constantly changing with respect to its composition between internal and aggregate demand in such a way that the economy will be a closed economy if the income elasticity

of demand for imports is lower than one, or the economy will exhibit permanent deficits of the trade balance if the income elasticity of demand for imports is higher than one.

Figure 1.2
Rate of growth consistent with a constant trade balance position that takes into account the role of the economic capacity.



One way in which we can stabilize the endogenous change of the aggregate demand is by incorporating the supply side of the economy through the economic capacity generated by capital accumulation. In fact, as it was explained, in line with a Harrodian idea about the double role of the investment, import demand of capital goods and general capital accumulation generate an economic capacity that decreases the demand for imports by a kind of import substitution. Thirlwall (2011) maintained that the external restriction is important, especially for developing countries because usually they

need to import capital goods in order to produce goods and services, but he omitted that precisely by generating goods and services developing countries are substituting imports. So capital accumulation is another way, besides exports, to relax the external restriction to the growth of the economies.

CHAPTER 2

EMPIRICAL LITERATURE REVIEW AND AN APPLICATION FOR THE MEXICAN CASE

2.1 Introduction.

From 1979, the year in which Thirlwall published his seminar paper "The Balance of Payments Constraint as an Explanation of the International Growth Rate Differences", there has been a mass of papers in which authors have applied the Thirlwall's law model in order to give an explanation of the performance of the rate of growth of many countries.

The analysis has been done for developed and developing countries, in some of them for individual countries and in some others for a group of countries, and for several different periods. There have been several econometric techniques used in each paper, from the Least Square Method to the Bound Test Approach to Cointegration.

In general, most of the papers support Thirlwall's Law, but we think that there is a general problem: whilst it is true that countries cannot growth by accumulating deficits/superavits of their trade balance, if the incorporation of the supply side of the economy through the incorporation of the economic capacity and then through the incorporation of the investment coefficient in the import demand function is necessary, then the estimations done so far have an omitted variable problem and although the rate of growth consistent whit trade balance equilibrium would be a good approximation of the effective rate of growth, the income elasticity of demand for imports estimated would not be unbiased. On the other hand, we will see that usually the income elasticities of demand for imports estimated are higher than one, but in contrast it is not usual to find economies in which their internal demand for domestic goods or their external demand

are being eliminated at all and we think that this is due to the role of the economic capacity. Moreover, the validation of the estimated rates of growth consistent with a constant trade balance position has been done by applying some kind of statistical methodology in which the effective rate of growth and the estimated rate of growth are compared but we think that it is more important to check what is happening with the trade balance positions of the countries during the period analyzed.

So, the objective of this chapter is to apply the modified Thirlwall's law model presented in chapter two in order to evaluate the role of the capital accumulation in the economic performance of the Mexican economy during the period 1951 – 2012. Given that, for a given income elasticity of demand for imports, we expect that the internal demand and the exports elasticities of demand for imports would change endogenously over the time, we use the rolling regressions technique; we estimate the import demand function for sub-periods of 24 years and then we estimate the rates of growth of the internal demand and of the exports consistent with a constant trade balance for each sub-period, then we analyze the relationship between the variation of the trade balance and the discrepancy between the actual rates of growth and the estimated ones.

This chapter is divided in four sections considering this introduction, in section two we provide a non-exhaustive review of some papers in which Thirlwall's law has been tested, we focus on the averages of the estimated income elasticities and in the validation procedure used in each paper; in section three we apply our modified model of the Thirlwall's law in order to evaluate the economic performance of the Mexican economy during the period 1951 – 2012, we contextualize our results with previous

studies about the Mexican economy that were done by using the original Thirlwall's model framework; in section four we present our final remarks.

2.2 Empirical literature review.

Thirlwall (1979) used previous estimations of the income elasticity of demand for imports in order to test the weak version of the Thirlwall's law for two sets of countries; the first set consisted of fifteen countries, fourteen European countries and South Africa, for the period 1953 – 1976 and in this case Houthakker and Magee's estimations of the income elasticity of demand for imports for the period 1951 – 1966 were used[13], whilst the second one consisted of eleven countries, ten European countries and the United States, for the period 1951 – 1973 and in this case Cornwall's estimations of the income elasticity of demand for imports for the period 1951 – 1973 were used[14]. The average of the income elasticities of demand for imports estimated for the first group of countries is 1.54, and just for two countries is lower than one; in the second group of countries the average of the income elasticities of demand for imports is 1.61, and for all of the countries it was higher than one. Thirlwall (1979) validates his results by getting the Spearman rank correlation between the rate of growth consistent with trade balance equilibrium and the effective rate of growth whose value for the first set of countries was 0.764 whilst for the second one was 0.891.

Thirlwall and Hussain (1982) tested a modified Thirlwall's law in which they incorporated the real capital flows and the effect of the relative price movements for three sets of developing countries. The first set consisted of six countries, for the period 1951 –

[13] Houthakker and Magee's estimations can be found in Houthakker and Magge (1969).

[14] Cornwall's estimations can be found in Cornwall (1977).

1969 and in this case Khan's estimations of the income elasticity of demand for imports are used[15]; the second one consisted of three countries for the period 1951 – 1966 and in this case Houthakker and Magee's estimations of the income elasticity of demand for imports were used; the third one consisted of eleven countries for a specific period for each country, and in this case Thirlwall and Hussain own estimations are used[16]. The average of the income elasticities of demand for imports estimated for the first set of countries is equal to 0.80, for the second one it is equal to 1.12, and for the third one it is equal to 0.91. Thirlwall and Hussain (1982) did not provide a methodology in order to validate their findings.

So, it is curious to find that developing countries exhibited a lower income elasticity of demand for imports than developed countries for a similar period. As it has been indicated by Prebisch (1950, 1959 and 1962) the problem of the developing countries in relation of their income elasticity of demand for imports is that it is usually higher than that of the developed countries[17].

Bairam (1988) tested the strong and the weak versions of the Thirlwall's Law for four sets of countries for the period 1970 – 1985 and in all the cases the income elasticities of demand for imports were estimated through the Two-Stage Least Squares

[15] Khan's estimations can be found in Khan (1974).

[16] Thirlwall and Hussain (1982) estimated the income elasticities of demand for imports through the OLS methodology.

[17] Although there are some empirical studies in which the implicit or even explicit income elasticity of a developed country is higher than that of a developing country, it is worth to note that some empirical studies did not take into account the origin of the imports of each country, it is important because Prebisch was comparing, more theoretically than empirically, the elasticities for developed and developing countries in relation to each other, so that intra-regional developed-developed or developing-developing trade is netted out. But in the empirical studies analyzed the comparison is between the two elasticities entirely empirically and entirely without any netting out. So it is possible that intra-North gross import elasticities are large that might explain the high overall elasticities of developed countries. It is possible that these considerations also account for the lower elasticities of the developing countries.

(2SLS) methodology; the first set consisted of four Western European Large countries, and the average of the income elasticities of demand for imports estimated was equal to 2.33; the second set consisted of eight Western European Small countries and the average of the income elasticities of demand for imports estimated was equal to 2.44; the third set consisted of five Southern European countries and the average of the income elasticities of demand for imports estimated was equal to 2.20; the fourth set consisted of two North American countries and the average of the income elasticity of demand for imports estimated was equal to 1.94. So, the averages of the income elasticities of demand for imports for the four sets of countries are very similar but it is worth to note that the corresponding to Southern European countries, the less developed set of countries, was the smallest of the three European sets of countries. Bairam (1988) validated his results by estimating the following equations:

$$g = \Omega_1 g_{tb}^1$$

and

$$g = \Omega_2 g_{tb}$$

By using the Ordinary Least Squares econometric technique, Bairam (1988) found that the strong version of the Thirlwall's Law could not be validate because the estimated

value of Ω_1 was not statistically equal to one; however, the weak version is validated because Ω_2 is statistically equal to one[18].

Bairam and Dempster (1991) tested the weak and the strong versions of Thirlwall's Law for eleven Asian countries and for a specific period for each country, each one of the periods used are, however, almost overlapped over the period 1961 - 1985. Bairam and Dempster (1991) used a maximum likelihood technique based on the Cochrane-Orcutt procedure in order to estimate the income elasticities of demand for imports; the average of the income elasticities of demand for imports estimated was equal to 2.36 and Bairam and Dempster (1991) validate their results for the weak case through a procedure developed by McCombie (1992): first an "equilibrium income elasticity of demand for imports" is calculated as the ratio rate of growth of exports to rate of growth of GDP, and then the null hypothesis about the equality between the income elasticity estimated and the equilibrium income elasticity of demand for imports is tested using the standard error estimated for the income elasticity of demand for imports for each country and calculating the corresponding t value. Bairam and Dempster (1991) found that the estimated values of the income elasticities of demand for imports were statistically not different from the equilibrium income elasticities of demand for imports for all the eleven countries.

Andersen (1993) used a cointegration technique in order to estimate the income elasticities of demand for exports and imports for sixteen developed countries for the period 1960 – 1990. The average of the estimated income elasticities of demand for imports was equal to 1.66. Then the author calculated the rate of growth consistent with

[18] According to McCombie (1997) this validation procedure has a problem given that the independent variable has an associated standard error, which means that it is a stochastic variable and the use of OLS will lead to bias in estimates.

trade balance equilibrium for three sub-periods, 1960 – 1973, 1973 – 1980, and 1980 – 1990, and the results were validated for each sub-period by estimating the following equation:

$$g_{tb} = \Omega_3 + \Omega_4 g$$

Then Andersen (1993) concluded that:

> "…the hypothesis of a close relationship between [g] and [g_{tb}] merely holds in the very long run and even then a 1:1 ratio between [g] and [g_{tb}] is only obtained when excluding Japan. In the short to medium term, actual and warranted demand growth do not appear to be very closely correlated." (Andersen 1993: 1284).

Atesoglu (1993a) tested the weak version of Thirlwall's Law for the case of the United States during the period 1955 – 1990; he got an estimated value of the income elasticity of demand for imports of 1.941 using the 2SLS econometric technique, then he calculated the averages of the rate of growth of the exports and of the GDP for overlapped sub-periods of 16 years each one, in this way he got twenty one estimated values of the rate of growth consistent whit trade balance equilibrium. Atesoglu (1993a) validated his results estimating the following equation:

$$g = \Omega_5 + \Omega_6 g_{tb}$$

Atesoglu (1993a) concludes that "The regression coefficient of [g_{tb}] is positive and significant at the conventional levels of significance, but it is also significantly different from unity and the intercept term is significantly different from zero." (Atesoglu 1993a: 511). However, Atesoglu (1993a) supported the validity of Thirlwall's Law because "…if earlier periods ending with 1970 through 1973 are omitted… …the intercept term is not significantly different from zero and the coefficient of [g_{tb}] is not significantly different from unity…" (Atesoglu 1993a: 511 – 512).

Atesoglu (1993b) tested the weak version of Thirlwall's law for the Canadian case for the period 1961 – 1991. He got an estimation of the income elasticity of demand for imports for the whole period and two more for the sub-periods 1961 – 1976 and 1977 – 1991. He used a Cochrane-Orcutt iterative procedure in order to estimate in a direct way the relationship between the rate of growth of the GDP and, the rate of growth of exports, the rate of growth of real imports less real exports and the differential of domestic and external inflations. The inverse of the estimated coefficient of the exports is the estimated income elasticity of demand for imports. Atesoglu (1993b) does not validate his results, but it is interesting to note that according to his estimations, the income elasticity of demand for imports of Canada during the 1961 – 1976 period was equal to 9.35 whilst for the 1977 – 1991 sub-period it was equal to 2.93, a very huge change.

Atesoglu (1994) tested the weak version of Thirlwall's Law for the case of Germany during the period 1963 – 1990; he got an estimated value of the income elasticity of demand for imports of 2.195 using the 2SLS econometric technique, then he calculated the averages of the rate of growth of the exports and of the GDP for overlapped sub-periods of 16 years each one, in this way he got thirteen estimated values

of the rate of growth consistent whit trade balance equilibrium. Atesoglu (1994) validated his results by arguing that "…the behaviour of relative prices in Germany… …reveals that they have been quite stable… (Atesoglu 1994: 90); so he argued that the fact that relative prices measured in a common currency have been constant supports the prediction power of Thirlwall's Law (see McCombie 1997).

Atesoglu (1997) tested the Thirlwall's Law for the case of the United State for the period 1931 – 1994. He used a cointegration technique in order to estimate the long run relationship between the GDP and exports, both of them expressed in logarithmic terms; so he calculated the estimated income elasticity of demand for imports as the inverse of the estimated parameter of the exports for the whole period and for three sub-periods 1950 – 1994, 1950 – 1973, and 1974 – 1994; for the complete period the estimated value of the income elasticity of demand for imports was equal to 1.63; for the sub-period 1950 – 1994 it was equal to 2.05; for the sub-period 1950 – 1973 it was equal to 1.58; and for the sub-period 1974 – 1994 it was equal to 2.40, although in this last case there was no evidence of cointegration between GDP and exports. So, Atesoglu (1997) concluded that:

> "The favorable results, of course, do not rule out the possibility that real income and real exports may not be cointegrated for some significant period of time, as is the case with the 1974-94 flexible-exchange-rate period. But the finding of cointegration for overall 1931-94 period suggests that the lack of cointegration observed during 1974-94 is a temporary phenomenon, and the economy's real income can be expected to move back to its path consistent with current account balance as predicted by the Harrod-Thirlwall balance-of-payments-constrained model." (Atesoglu 1997: 333).

Atesoglu (1997) does not provide a validation process for his results.

With the increased utilization of cointegration techniques in the estimation of economic relationships, some authors argued that Thirlwall's Law had to be re-estimated by using cointegration techniques, however, McCombie (1997) indicated that:

> "…it is difficult to see why the putative loss of information incurred by using the dynamic rather than the static specification poses a serious problem. The law pertains to long-run *equilibrium growth rates* and not to the determinants of the *equilibrium levels* of economic activity. Just as tests of the endogenous growth models mostly use growth rates and not levels, so law is strictly speaking, also an explanation of differing growth rates, and not levels, of income. The fact that the law relates to a long-run relationship is taken into account by testing the relationship for periods of several years and not, for example, using annual data." (McCombie 1997: 355 – 356).

So McCombie (1997) got estimations of the income elasticity of demand for imports, by two ways, for the United States, Japan, and the United Kingdom for the period 1952 – 1993: through the estimation of a log-log import demand function by the Maximum Likelihood method with an AR[1] error structure, and through the estimation, by the OLS method, of the rate of growth of the imports with respect to the rate of growth of GDP and other variables. He indicated that:

> "…the estimates of the income elasticity of demand are very similar to the first-difference estimates, although the standard error is larger using first difference… It is interesting, however, that the Ramsey RESET test rejects the functional form of the log-level model but not of the first difference specification." (McCombie 1997: 363).

Then McCombie (1997) used the estimated income elasticities obtained using the OLS method. In the case of the United States, the estimated value of the income elasticity of demand for imports was equal to 1.827 for the period 1952 – 1973, and it was equal to 2.46 for the period 1973 – 1993; for Japan, the estimated value of the income elasticity of demand for imports for the period 1952 - 1993 was equal to 1.474; and for the United Kingdom the estimated value of the income elasticity of demand for imports was equal to 2.082. McCombie (1997) validates his results using the "equilibrium income elasticity of demand for imports" and testing the null hypothesis about the equality between the income elasticity estimated and the equilibrium income elasticity of demand for imports. He concluded that:

> "…the growth rates of the United States and the United Kingdom were close to their balance-of-payments equilibrium growth rate. The evidence suggests that Japan, on the other hand, grew more slowly than its balance-of-payments equilibrium growth rate, which is consistent with the large current account surpluses it was acquiring over much of the postwar period." (McCombie 1997: 373).

Hieke (1997) used a cointegration technique in order to estimate the income elasticity of demand for imports of the United States for the period 1950 – 1990 and he argued that:

> "The present study provides clear evidence that empirical tests of Thirlwall's Law may not be based on a single estimate covering the entire post-World War II era, but should distinguish among different time periods. Furthermore, our findings indicate that, owing

to the change in income elasticity of demand for imports, it is appropriate to subdivide the data series already in the late 1960s" (Heike 1997: 319 – 320).

Hieke (1997) got estimated values of the income elasticity of demand for imports of 1.2910 for the period 1950 – 1966, 2.4364 for the period 1967 -1986, 2.3383 for the period 1967 - 1990, 2.3866 for the period 1972 – 1986, and 2.2993 for the period 1972 - 1990. He validated its results by testing the statistical equality between the effective rate of growth and the estimated rate of growth consistent with a trade balance equilibrium, and he concluded that:

> "The equilibrium rates of growth, [g_{tb}], provide a good approximation of the actual growth rates, [g], for the three subperiods 1950-66, 1967-90, and 1972-9.
>
> …for 1967-86 and 1972-86… …the equilibrium rate of growth [g_{tb}], is considerably below the actual rate of growth, [g]." (Hieke 1997: 321).

Alonso and Garcimartín (1998) estimated the income elasticity of demand for imports for ten OECD countries for the period 1965 – 1994; the average of the estimated values of the income elasticities of demand for imports for the OLS method was equal to 1.626. Alonso and Garcimartín (1998) validated their results using a system of equations in which trade balance deficits are corrected by movements in prices and/or income; they found that there is evidence supporting that the adjustment is done by income movements for all the countries with the exceptions of the United States and France, on the other hand, there is no evidence supporting a correction of a trade balance deficit through price movements for any one of the ten countries.

Turner (1999) tested the Thirlwall's Law for the G7 economies for the period 1956 – 1995 and the sub-periods 1956 – 1973 and 1974 - 1995; the average of the estimated values of the income elasticities of demand for imports for the period 1956 – 1995 was equal to 1.86, for the period 1956 -1973 was equal to 1.84, and for the period 1974 – 1995 was equal to 2.07. Turner (1999) did not validate his results but he concluded that:

> "…for the full sample… Comparisons of the predicted rates with the actual rates of GDP growth indicate a close match. …for the period 1956-73. These are somewhat less satisfactory than for the whole sample. …it is clear that support for the Thirlwall hypothesis during this period is mixed at best. …for the 1974-95 sub-period… These results improve on those for the earlier sub-period…" (Turner 1999: 50 – 51).

Serrano Sanz, et al. (1999) tested the Thirlwall's law for the Spanish economy for the period 1940 – 1985. They used an Autoregressive Distributed Lags (ADL) methodology in order to estimate the income elasticity of demand for imports. For the period 1940 – 1959 they got an estimated income elasticity of demand for imports equal to 1.80, whilst for the 1960 – 1985 they got a value equal to 1.37. Serrano Sanz, et al. (1999) validated their results using the "equilibrium income elasticity of demand for imports" and testing the null hypothesis about the equality between the income elasticity estimated and the equilibrium income elasticity of demand for imports; they found that in both sub-periods the null hypothesis is rejected, but incorporating the movements of the real exchange rate in the determination of the rate of growth consistent with trade balance equilibrium during the first sub-period it cannot be rejected; in the same way,

incorporating the movements of the real exchange rate and the positive evolution of the service balance in the second sub-period, the null hypothesis cannot be rejected.

Perraton and Turner (1999) tested the Thirlwall's law for fifteen industrial countries for the period 1957 – 1995; they used a Seemingly Unrelated Regression Estimator (SURE) methodology in order to allow for common shocks. The average of the income elasticities of demand for imports estimated was equal to 1.2541 and they validated their results through the estimation of the following equation:

$$g = \Omega_5 + \Omega_6 g_{tb}$$

Then they concluded that:

> "Despite the apparent failure of the model in the unweighted regressions, it is possible to argue that its central purpose is to explain overall levels of world growth and therefore it is unreasonable to reject it because it fails to explain the growth rates of small countries such as Ireland and New Zealand very accurately. As an alternative we therefore tried weighting the observations by the share of each country in total 1977 industrial country GDP. The results are starling, with the strong form regression now indicating strong support for the Thirlwall's hypothesis. However, in this case we were somewhat concerned that the presence of the US in the sample might bias the results because of its large (40%) share in total GDP. This is consistent with time-series estimates for the US that support Thirlwall's hypothesis (Atesogl[u], 1993). We experimented by excluding the US and found that, while the predicted growth rate remains significantly positive, its coefficient is now significantly different from one. The pattern of these results is repeated for the weak form of the hypothesis, though in this case the coefficient on the predicted growth rate is consistently significantly below one." (Perraton and Turner 1999: 727).

Moreno-Brid and Pérez (1999) tested the Thirlwall's law for five Central American countries for the period 1950 – 1996. They estimated a cointegration relationship between GDP and exports, both in logarithmic terms, and then they calculated the income elasticity of demand for imports as the inverse of the exports coefficient; the average of the income elasticities estimated was equal to 1.99. Moreno-Brid and Pérez (1999) indicated that "With the exception of El Salvador and Honduras, the observed growth rates of GDP are rather close (below one percentage point) to the balance-of-payments-constrained ones" (Moreno-Brid and Pérez 1999: 143). So, for two of five countries the predictions of Thirlwall's laws are not very efficient and then Moreno-Brid and Pérez (1999) indicated that their results corroborate the limited explanatory power of the weak version of the Thirlwall's Law (see McCombie, 1997).

León-Ledesma (1999) tested the Thirlwall's Law for the Spanish economy for the period 1965 – 1993; he used a 2SLS method in order to estimate the income elasticity of demand for imports which was equal to 1.916. Then Léon-Ledesma (1999) used twenty overlapped periods of ten years each one and he got a series of twenty observations of the rate of growth consistent with trade balance equilibrium which exhibited a positive correlation with the effective rate of growth. In order to validate his results, León-Ledesma (1999) estimated the following equation:

$$g = \Omega_5 + \Omega_6 g_{tb}$$

and he concluded that:

> "At 95 percent confidence level, [Ω_6] is not significantly different from one, while [Ω_5] is not statistically different from zero. If we remove the three periods of great instability, 1975 -84, 1976-85, and 1977-86… The results strongly support the theory; [Ω_5]=0 and [Ω_6]=1 at the 95 percent confidence level." (Léon-Ledesma 1999: 437).

Hussain (1999) tested the Thirlwall's Law for the case of twenty nine African countries and eleven Asian countries for different but very similar periods, all of them overlapped between 1971 and 1990. In order to validate his results, Hussain (1999) calculated the "equilibrium income elasticity of demand for imports" as the ratio rate of growth of exports to rate of growth of GDP for the basic model, and an "alternative equilibrium income elasticity of demand for imports" that incorporates changes in the real exchange rate and the capital flows for the extended model, then he concluded that:

> "For the basic model, it may be seen that, of the full sample of 40 African and Asian countries, 22 countries have a predicted growth rate which is not statistically different from the actual growth rate… As for the extended model, the test shows that 29 of the full sample of 40 countries, the predicted growth rate is statistically equal to the actual growth rate…
>
> Thus there are 33 countries of the full sample where at least one of the two versions of the model gives a prediction which is not statistically different from the actual growth rate." (Hussain 1999: 116 – 117).

Alonso (1999) tested the Thirlwall's Law for the Spanish case for the period 1960 – 1994; he used a cointegration methodology in order to estimate the income elasticity of demand for imports which was equal to 1.772. Alonso (1999) validated his results

calculating the rate of growth consistent with trade balance equilibrium for each year and through the estimation of the following equation:

$$g = \Omega_5 + \Omega_6 g_{tb}$$

Alonso (1999) founds that "The constant term is not significantly different from zero and the coefficient is not significantly different from unity…" (Alonso 1999: 250).

López and Cruz (2000) tested the Thirlwall's Law for the Argentinean, Brazilian, Colombian, and Mexican cases for the period 1965 – 1996. They used a cointegration technique in order to estimate the income elasticities of demand for imports, which were equal to 2.8, 1.03, 1.8 and 1.3 for Argentina, Brazil, Colombia, and Mexico respectively. They compared the "equilibrium income elasticities of demand for imports", calculated as the ratios rate of growth of exports to rate of growth of GDP, for each one of the four countries, with the estimated income elasticities of demand for imports and they found that "…in Argentina, Colombia, and Mexico, the estimated elasticities of imports tend to exceed the "equilibrium" elasticities of imports" (López and Cruz 2000: 485).

Ansari et. al. (2000) tested the Thirlwall's Law for four Southeast Asian countries: Indonesia, Malaysia, Philippines, and Thailand. They used the OLS method in order to estimate the income elasticities of demand for imports. Ansari, et. al. (2000) did not validate their results, but they found that the averages of the income elasticities of demand for imports and of the difference between the effective and the predicted rates of growth were equal to 2.50 and 0.99.

Bértola, et al. (2002) tested the Thirlwall's Law for the case of Brazil for the period 1890 – 1973; they used a cointegration methodology in order to estimate the ratio between the income elasticity of demand for exports to the income elasticity of demand for imports which was equal to 0.9725. It is important to note that Bértola, et al. (2002) found that the coefficient of a time trend series was also statistically significant in the cointegration equation, so they argued that "…the long-run processes of technological learning and structural change (which slowly altered Brazil's international competitiveness) are represented in our work through a time trend. It would be highly desirable to include variables directly related to technological learning and specialization." (Bértola, et al. 2002: 137).

Bekö (2003) tested the Thirlwall's Law for the case of Slovenia for the quarterly period 1992:1 – 1999:1; he used a cointegration methodology in order to estimate the income elasticity of demand for imports which was equal to 1.616. Bekö (2003) did not validate his results but he found that the predicted rate of growth was very near to the effective rate of growth, 3.64 versus 4.03.

Jaime Jr (2003) tested the Thirlwall's Law for the Brazilian case for the period 1955 – 1998 and for the sub-periods 1981 – 1998, 1981 – 1998, 1955 – 1989, 1955 – 1980, 1966 – 1998, and 1966 – 1980. He used a cointegration methodology in order to estimate the income elasticity of demand for imports for the period and sub-periods of analysis and he concluded that:

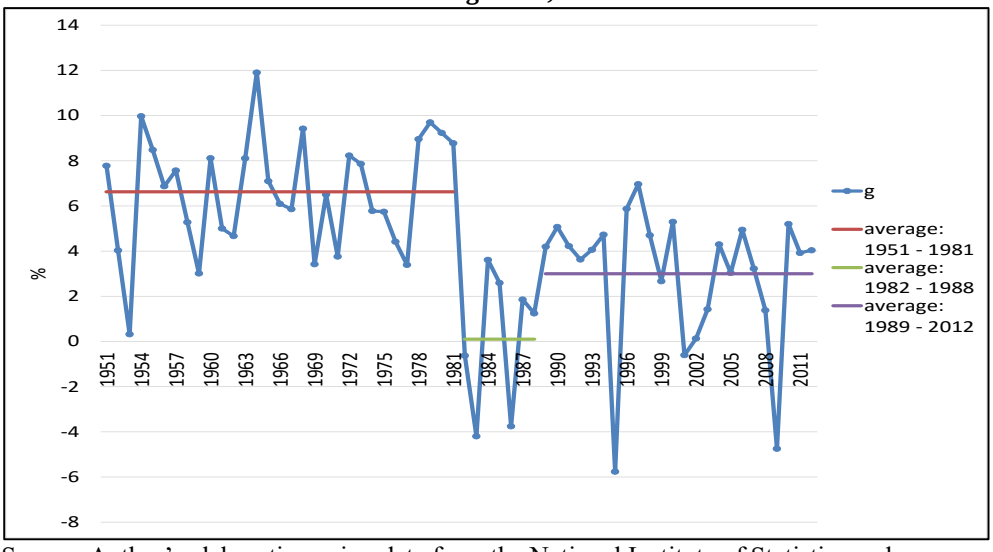
> "For 1955-89 the results do not present a difference from the total sample since the implicit income elasticity of demand for imports is also 2.38. This behavior suggest that trade liberalization in Brazil after 1990 did not imply changes in income elasticity of

demand for imports, and further studies should attempt to demonstrate why." (Jaime Jr 2003: 75).

2.3 The case of Mexico.

The Mexican Economy exhibited an outstanding rate of economic growth from 1951 to 1981, 6.61% in average per year; however, the Debt Crisis of 1982 gave place to a seven years period in which the annual average of the rate of growth was just 0.10%; during this stationary period the economic authorities implemented some economic reforms with the objective of liberalize the economy and in general the importance of the government in the economic working was decreased in a substantial way; however, these changes did not produce the expected results, whilst it is true that the rate of growth was increased, from 1989 to 2012 its annual average was 2.94%, it was less than a half of its value during the first sub-period (see Figure (2.1)).

Figure 2.1
Annual rate of growth, 1951 – 2012.



Source: Author's elaboration using data from the National Institute of Statistics and Geography (INEGI by its acronym in Spanish).

So, how can we explain the strong decreased of the rate of growth of the economy since 1982 and the disappointing results of the liberalization process after 1989? Some authors have explained the slowdown of the rate of growth of the Mexican economy through an increase of the income elasticity of demand for imports (see Moreno-Brid, 1998b and 1999, López and Cruz, 2000 and Guerrero de Lizardi, 2006) and an outflow of capital process (Moreno Brid, 1998b and 1999).

Now, we think that there are some problems when we analyze the results presented by the authors previously mentioned. In the case of Moreno-Brid (1998b), it is indicated that the income elasticity of demand for imports changed from 1.16, between 1950 and 1981, to 6.34 between 1988 and 1994, and that in consequence the rate of growth consistent with trade balance equilibrium changed from 4.67% during the first sub-period to 0.65% during the second one; as an implication, the differences between the effective rate of growth and the rate of growth consistent with trade balance equilibrium were 2.19% and 2.14% respectively. In this respect, Moreno-Brid (1998b) indicates that "In 1950-75 and 1976-81, international capital flows were a major source of foreign exchange to Mexico…" (Moreno-Brid 1998b: 426), and that from 1988 to 1994 "…the favourable reinsertion of the Mexican economy in the international capital markets, [brought] about a massive net inflow of foreign capital." (Moreno-Brid 1998b: 429).

So, according to Moreno-Brid (1998b) in both sub-periods Mexican economy financed its excess of imports through capital flows, but from 1951 to 1981 the average of the annual change of the trade balance deficit as a percentage of the GDP was 0.04%; whilst from 1988 to 1994 the same indicator was -0.87%, so in both cases the values are

so small as to indicate that the capital inflows were related to the exhibited excesses of growth with respect to the respective rates of growth consistent with trade balance equilibrium.

With respect to Moreno-Brid (1999), it is indicated through a cointegration estimation that the income elasticity of demand for imports changed from 1.05 between 1950 and 1981 to 2.47 between 1982 and 1996 and that in consequence the rate of growth consistent with trade balance equilibrium changed from 5.37% during the first sub-period to 3.32% during the second one; as an implication, the differences between the effective rate of growth and the rate of growth consistent with trade balance equilibrium were 1.28% and -2.23% respectively, but whilst in the first sub-period the average of the annual change of the trade balance deficit as a percentage of the GDP was 0.04% in the second one the same indicator was equal to 0.57%, so again the changes are so small to take into account the excess of growth during the first period and the shortcoming exhibited during the second one.

López and Cruz (2000) indicate that:

> "Since we support our reasoning with econometric analysis, it seems appropriate to state clearly the scope and limits of our research. What interests us is some theoretical and economic policy issues related to the theory of the balance-of-payments-constrained growth. The purpose of our econometric work is to show the plausibility of the assumed relation between economic variables rather than discover the particular values of the parameters. In fact, to estimate the values of the parameters adequately would require a complete model, with a larger set of variables, which is beyond the scope of this paper" (López and Cruz 2000: 478 – 479).

So, even although they found the existence of a cointegration relationship between output and exports for the Mexican case for the period 1965 - 1996, their result implies a much higher income elasticity of demand for imports than the "equilibrium" income elasticity of demand for imports, 1.3 versus 0.45, but it implies that Mexican economy had to accumulate a huge trade balance deficit during the period of analysis, in contrast, the annual average of the change of the trade balance deficit as a percentage of the GDP during this period was equal to 0.25%,. In this respect López and Cruz establish that "The two big crisis (1982 and 1995) Mexico suffered in the period under consideration were the direct outcome of this disequilibrium." (López and Cruz 2000: 485), but as Moreno-Brid (1999) mentioned:

> "…in 1978 Mexico accelerated its economic expansion, driven by an ambitious industrialization strategy financed by oil exports and foreign loans. This expansion peaked in 1979 and 1980 when GDP grew at annual rates close to 9% in real terms. Furthermore, such dash-for-growth was taking place while keeping relatively stable inflation and moderate fiscal and foreign trade deficits… …In 1982, the overexpansion of public expenditure funded through short-term foreign loans, the weakening of the international prices, the rise in interest rates in world financial markets and the drastic cut in Mexico's access to foreign capital combined to detonate a severe fiscal and balance of payments crisis." (Moreno-Brid 1999: 149 – 150).

In the same line Moreno-Brid and Ros (2009) argue that:

> "It is perhaps in the macroeconomics of elite conflict within a dominant party state [PRI], rather [than] in the traditional interpretations of macroeconomic populism or in the

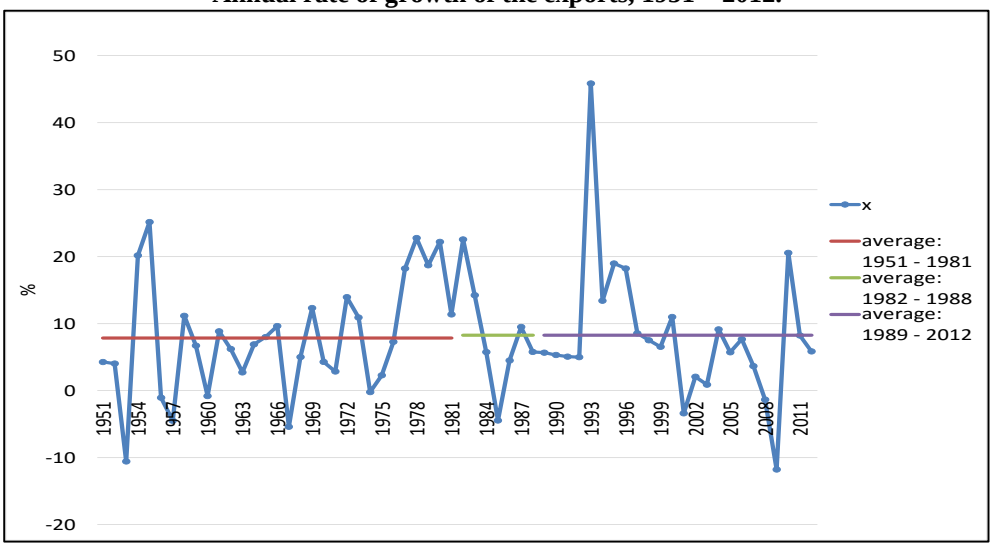
> exhaustion of the industrialization model, that we must search for the internal causes of the crises" (Moreno-Brid and Ros 2009: 145).

It is difficult to establish the period of analysis used by Guerrero de Lizardi (2006) but it looks like it is going from 1925 to 2000; for these years the author found the existence of a contegration relationship between Mexican GDP and USA GDP with a ratio export/import income elasticities equal to 1.505; for us it is a bit strange to accept that for such a long time the income elasticity of demand for exports from Mexico of USA was higher than the income elasticity of demand for imports from USA of Mexico, but even if we do not take into account this aspect, the annual average of the effective rate of growth of the Mexican economy was equal to 5.14% whilst its rate of growth consistent with trade balance equilibrium was 6.15%, so, during such a long period Mexican economy has to be accumulating superavits of trade balance which is not consistent with the reality.

Now, as it can be seen in Figure (2.2), the averages of the annual rate of growth of the exports were almost the same for the three sub-periods of analysis, from 1951 to 1981 it was equal to 7.85%, from 1982 to 1988 it was equal to 8.26%, and from 1989 to 2012 it was equal to 8.47%, so in line with the authors previously mentioned, the slowdown of the rate of growth could be a result of an increase of the income elasticity of demand for imports. But according to our modified model of the Thirlwall's Law that is not the whole explanation; on one hand, the apparent success of the export sector from the first years of the eighties and especially from the mid-nineties with respect to its increase as a percentage of the GDP (see Figure (2.3)) was not the result of an increase of its rate of growth, as it was already indicated, but it was the result of a strong slowdown of the rate

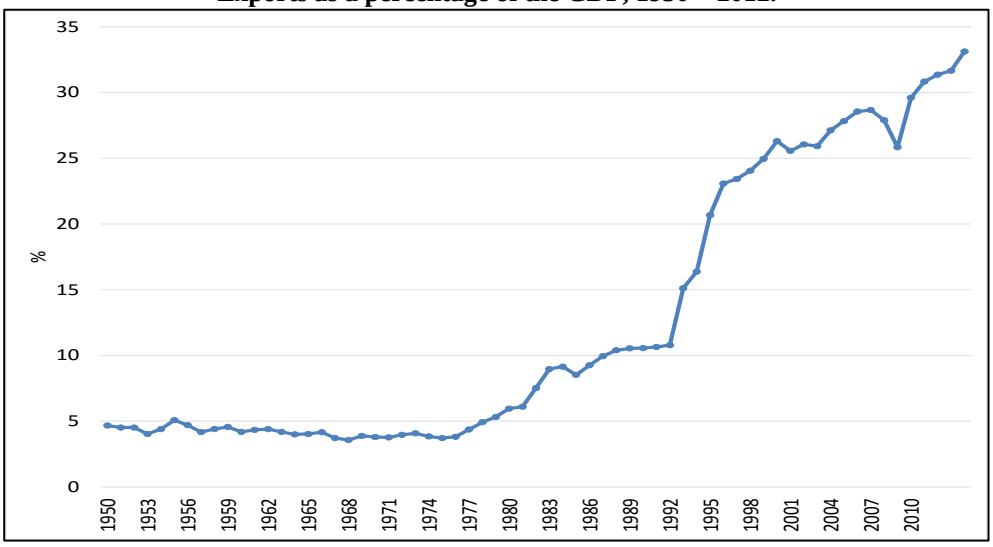
of growth of the internal demand for domestic goods whose average for the sub-period 1951 – 1981 was equal to 6.55%, for the sub-period 1982 – 1988 was equal to -0.53%, and for the sub-period 1989 – 2012 was equal to 1.67% (see Figure (2.4)).

Figure 2.2
Annual rate of growth of the exports, 1951 – 2012.



Source: Author's elaboration using data from the INEGI and ECLAC.

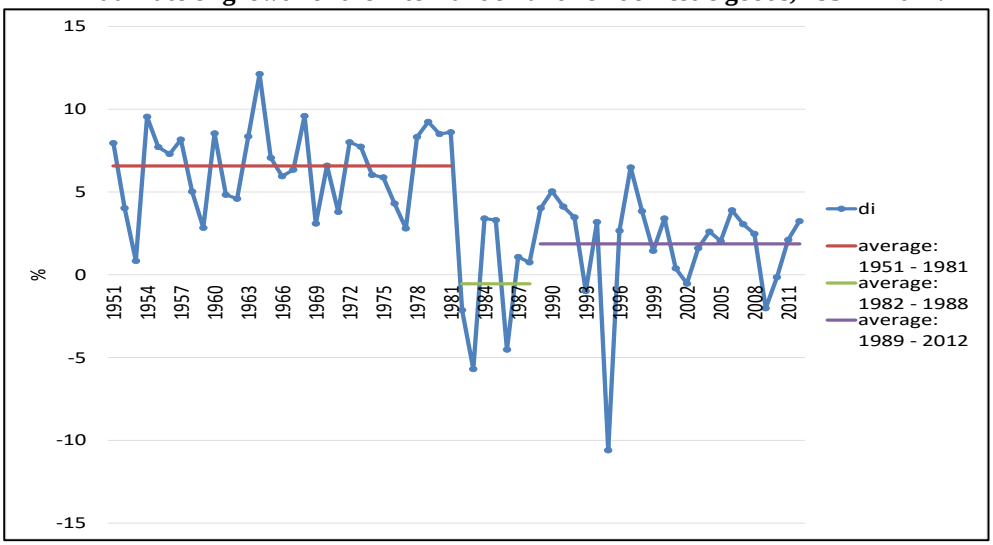
Figure 2.3
Exports as a percentage of the GDP, 1950 – 2012.



Source: Author's elaboration using data from INEGI and ECLAC.

Figure 2.4.

Annual rate of growth of the internal demand for domestic goods, 1951 – 2012.



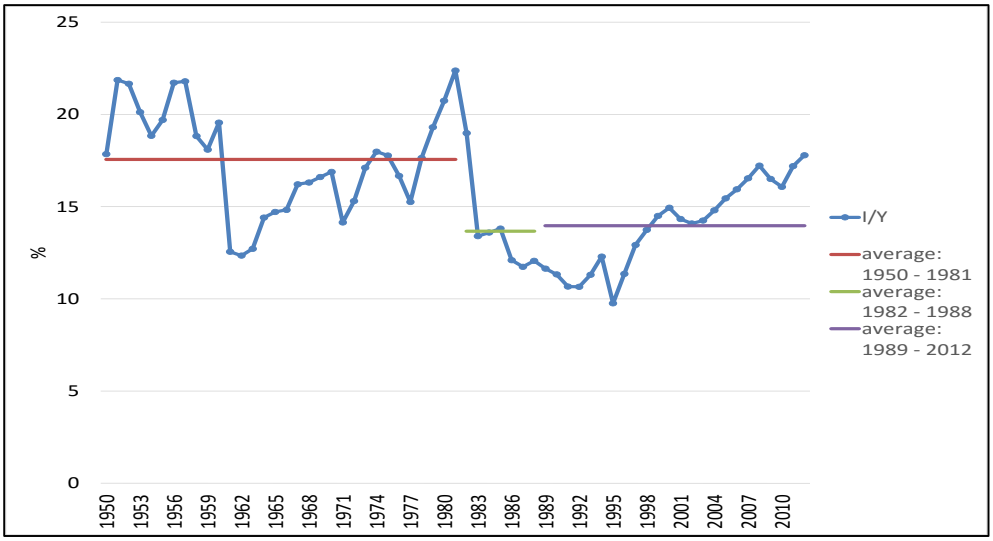
Source: Author's elaboration using data from the INEGI and ECLAC.

On the other hand, the sub-period 1951 – 1981 was part of the state-led industrialization period[19] in which the Import Substitution Strategy of Industrialization gave place to a strong investment regime and consequently to a vigorous process of generation of economic capacity. In effect, as it can be seen in Figure (2.5), the average of the investment share of GDP, without considering the investment in residential construction, for the sub-period 1950 – 1981 was equal to 17.56%; however, the shift in the economic paradigm from the Debt crisis of 1982 and the diminution of the role of the state in the working of the economy induced a low investment regime and also a change in the composition of the total investment; so, from 1982 to 1988 the annual average of the investment share of GDP was equal to 13.67% and from 1989 to 2012 it was equal to 13.97%. Moreover, the reduction of the total investment share of GDP was a result of a decrease of the non-residential construction investment share of GDP that was higher in absolute value than the increase in the machinery and equipment investment share of the

[19] See Ocampo and Ros (2011).

GDP. The annual averages of the non-residential construction and machinery and equipment investment shares of GDP were equal to 13.32% and 4.24% from 1951 to 1981, they were equal to 10.12% and 3.55% from 1982 to 1988 and they were equal to 6.61% and 7.36% from 1989 to 2012. The behavior of the investment coefficient and of its composition were reflected at a rate of growth of the economic capacity equal to 7.02% in annual average from 1951 to 1981; 1.19% in annual average from 1982 to 1988; and 2.92% in annual average from 1989 to 2012 (see Figure 2.6).

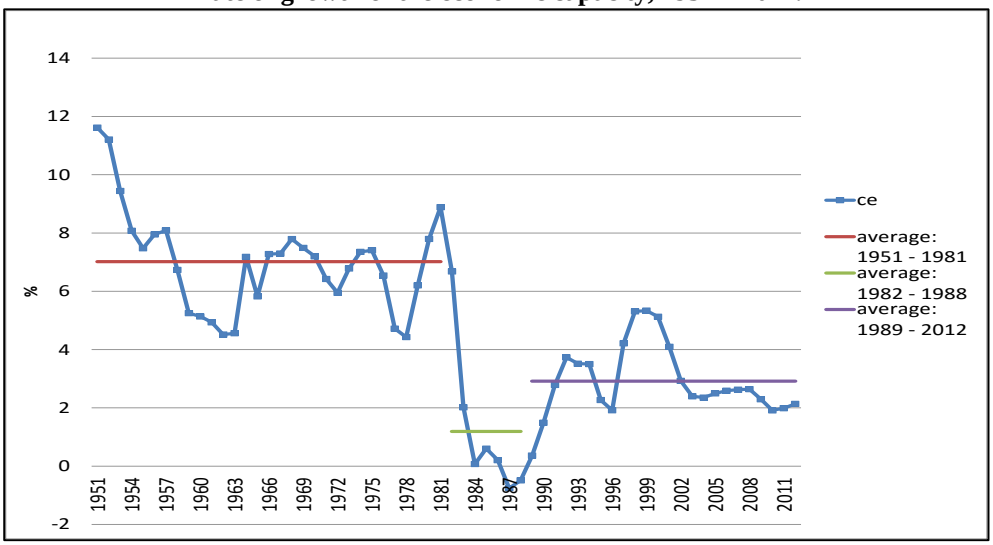
Figure 2.5
Investment share of GDP, 1950 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC and Hofman (2000).
Note: We are just considering productive investment; investment in residential construction is not taken into account.

Figure 2.6

Rate of growth of the economic capacity, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC and Hofman (2000).
Note: In appendix I we show the way in which we estimate the Economic Capacity of Mexico.

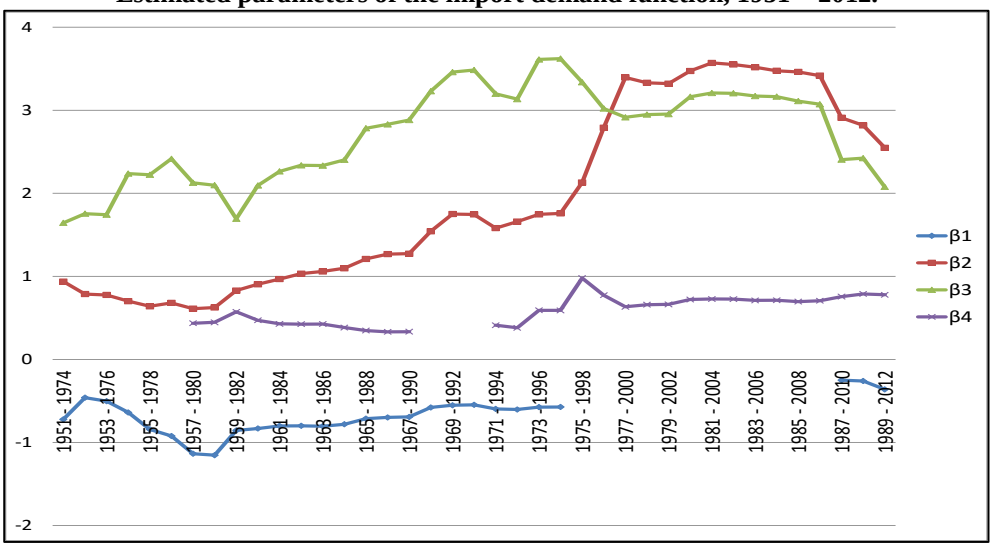
Now we apply our modified model of the Thirlwall's Law in order to understand the slowdown of the rate of growth of the Mexican economy after the 1982 Debt Crisis. As a first step we estimate the import demand equation of the Mexican economy, based on the equation (1.57'), for overlapped sub-periods of twenty four years each one of them[20]; we decided to use this "rolling regressions" technique given the fact that we expect that the estimated parameters could not be constant over the time, but they could be changing, even if the income elasticity of demand for imports is constant, if internal demand and exports are not growing at the same rate. So we use the Ordinary Least Square Method in order to estimate the next equation for each of the overlapped sub-periods:

$$m = \hat{\beta}_1\hat{\theta}_t + \hat{\beta}_2 ce_t + \hat{\beta}_3(di_t - ce_t) + \hat{\beta}_4(x_t - ce_t) + \varepsilon_t \qquad (2.1)$$

[20] We take as a reference the six years presidential periods in Mexico.

where $\hat{\beta}_j$ are the parameters to be estimated and ε_t is a white noise. As it can be seen in Figure (2.7) the estimated parameters have their expected values when they were statistically significant; the economic capacity, the internal demand, and the export elasticities of demand for imports were all of them positive whilst the real exchange rate elasticities of demand for imports were negative[21].

Figure 2.7
Estimated parameters of the import demand function, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

It is important to note in our next analysis that given the fact that we use overlapped periods, the averages of the variables are not equal to some of the values previously mentioned because they were obtained from media-centered series.

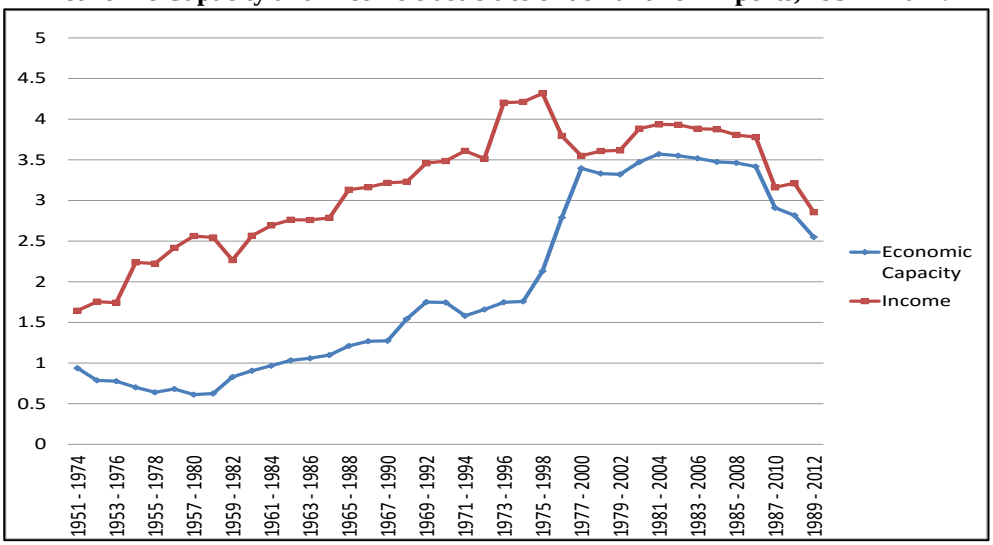
As it can be seen from equation (1.57') we can get the income elasticity of demand for imports by adding β_3 and β_4. So, in Figure (2.8) we present the economic capacity and the income elasticities of demand for imports. We find that the income

[21] A full description of the statistical properties of the regressions is presented in appendix II.

elasticity of demand for imports exhibited an increasing behavior between the sub-period 1951 – 1974 and the sub-period 1972 – 1995, when it passed from 1.64 to 3.51; then between the sub-period 1973 – 1996 and the sub-period 1986 – 2009, it was more or less constant around 3.88; and then it decreased to 2.86 during the sub-period 1989 – 2012. On the other hand, we find that the economic capacity elasticity was decreasing between the sub-period 1951 – 1974 and the sub-period 1958 – 1981, when it passed from 0.94 to 0.63; then it was increased to 1.75 during the sub-period 1969 – 1992; then between the sub-period 1970 – 1993 and the sub-period 1974 – 1997 it was more or less stable around 1.66; then it was strongly increased to 3.40 during the sub-period 1977 – 2000; then it was more or less stable around 3.46 between the sub-period 1977 – 2000 and the sub-period 1986 – 2009; and then it was decreased to 2.55 during the sub-period 1989 – 2012; it is consistent with the fact that the Mexican economy started its liberalization process, especially with respect to capital goods, and its promotion of the maquila export industry in the second half of the seventies. Also, it is worth to mention that we can get an indicator of the net effect of the creation of economic capacity on the rate of growth of imports by subtracting the economic capacity elasticity of demand for imports to the income elasticity of demand for imports, if the result is positive each one percent of increase of the economic capacity is contributing to reduce the rate of growth of the imports; this value was increasing from 0.71 to 1.54 between the sub-period 1951 – 1974 and the sub-period 1954 – 1977; then it was more or less stable around 1.84 between the sub-period 1954 – 1977 and the sub-period 1975 – 1998; then it was strongly decreased and it was more or less stable around 0.33 between the sub-period 1977 – 2000 and the sub-period 1989 – 2012.

Figure 2.8

Economic Capacity and Income elasticities of demand for imports, 1951 – 2012.

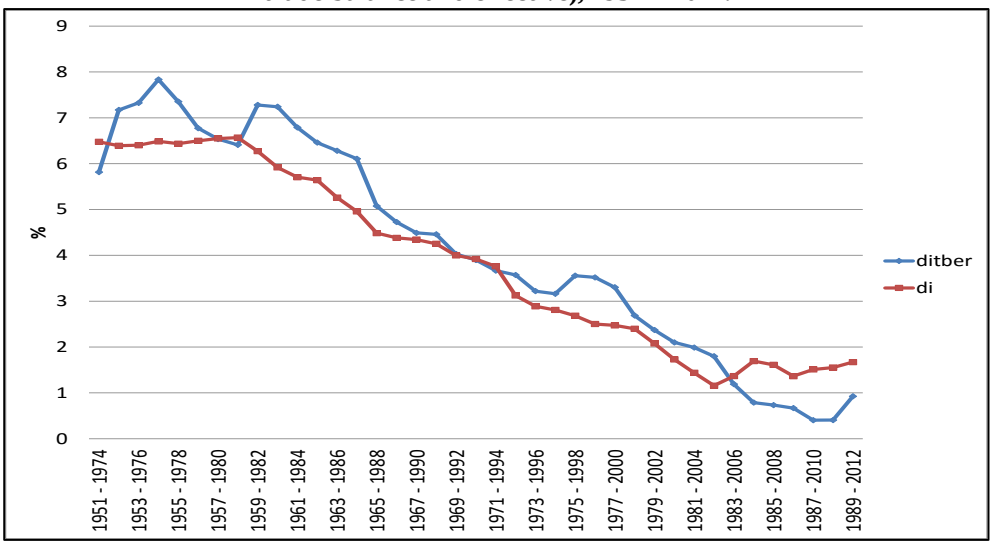


Source: Author's elaboration using data showed in figure (2.7).

Using the estimated parameters presented in Figure (2.7), the rate of growth of the real exchange rate, the rate of growth of the exports, the rate of growth of the economic capacity, the ratio internal demand to GDP, and the ratio exports to imports, we determine the rates of growth of the internal demand and of the GDP consistent with a constant trade balance position; our estimations are very close to the respective effective rates of growth. So, the averages of the annual rate of growth of the internal demand for domestic goods consistent with a constant trade balance position and of the effective rate of growth of the internal demand for domestic goods were equal to 6.22% and 5.63% respectively from the sub-period 1951 – 1974 to the sub-period 1969 - 1992; to 3.51% and 3.10% from the sub-period 1970 – 1993 to the sub-period 1976 - 1999; and to 1.49% and 1.70% from the sub-period 1971 – 1994 to the sub-period 1989 - 2012 (see Figure (2.9)); those values are consistent with the average of the annual change of the trade balance position for each sub-period (0.22%, 0.21% and -0.05% respectively). In the case of the rate of growth consistent with a constant trade balance position and of the effective

rate of growth, the respective averages were 6.33% and 5.78% from the sub-period 1951 to 1974 to the sub-period 1969 - 1992; 4.16% and 3.77% from the sub-period 1970 to 1993 to the sub-period 1976 - 1999; and 2.83% and 2.80% from the sub-period 1977 – 2000 to the sub-period 1989 to 2012 (see Figure 2.10).

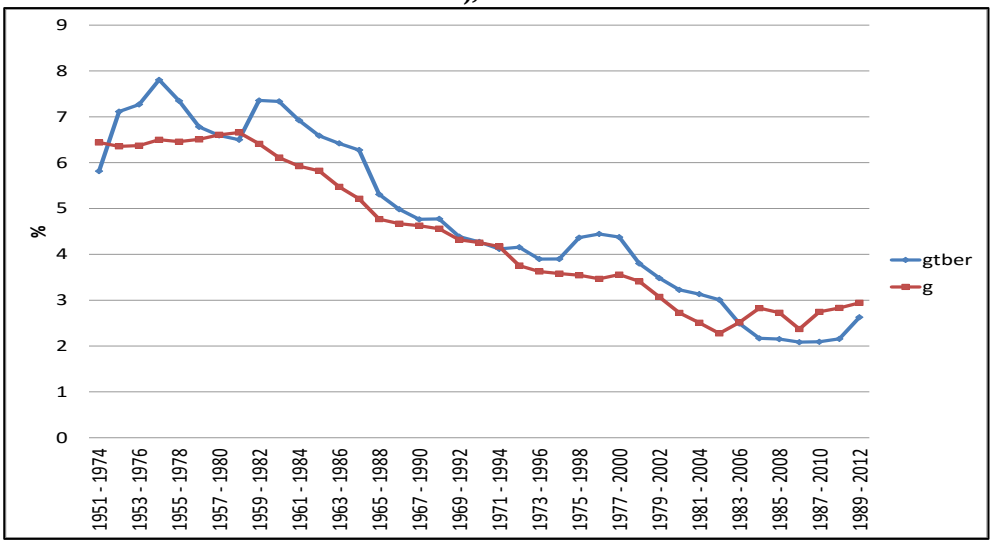
Figure 2.9.
Rate of growth of the internal demand for domestic goods (consistent with a constant trade balance and effective), 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

Figure 2.10

Rate of growth of the GDP (consistent with a constant trade balance position and effective), 1951 – 2012.

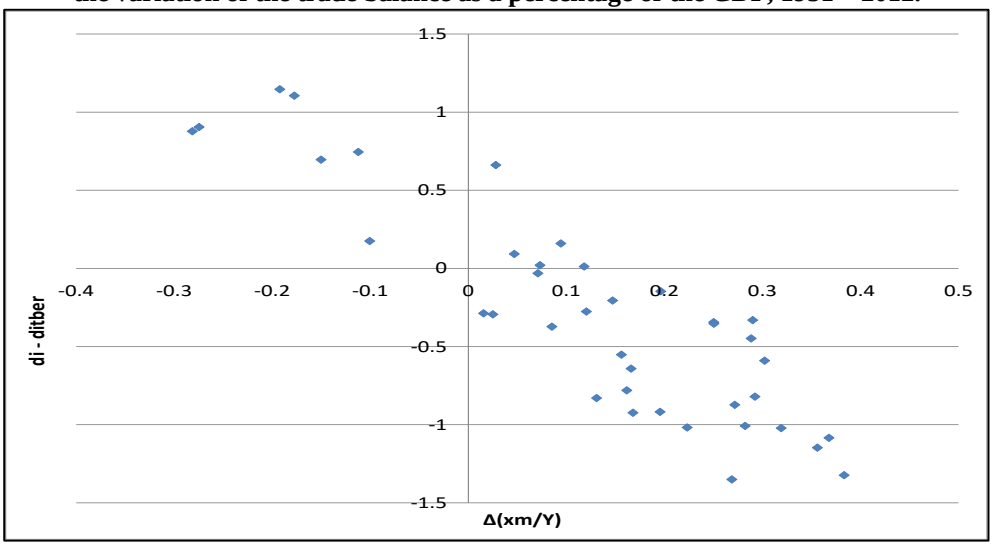


Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

Previous to develop an analysis of our results we want to corroborate if our estimations are consistent with the behavior of the Mexican trade balance during the period 1951 – 2012. As it can be seen in the Figures (2.11) and (2.12), the annual average of the variation of the trade balance position as a percentage of the GDP ($\Delta(xm/Y)$) exhibits a negative relationship with both, the excess of the effective rate of growth of the internal demand over the rate of growth of the internal demand consistent with a constant trade balance position (*di* – *ditber*) and the excess of the effective rate of growth over the rate of growth consistent with a constant trade balance position (*g* – *gtber*), i. e. when the effective rates of growth were higher than these consistent with a constant trade balance position then the trade balance position was reduced.

Figure 2.11

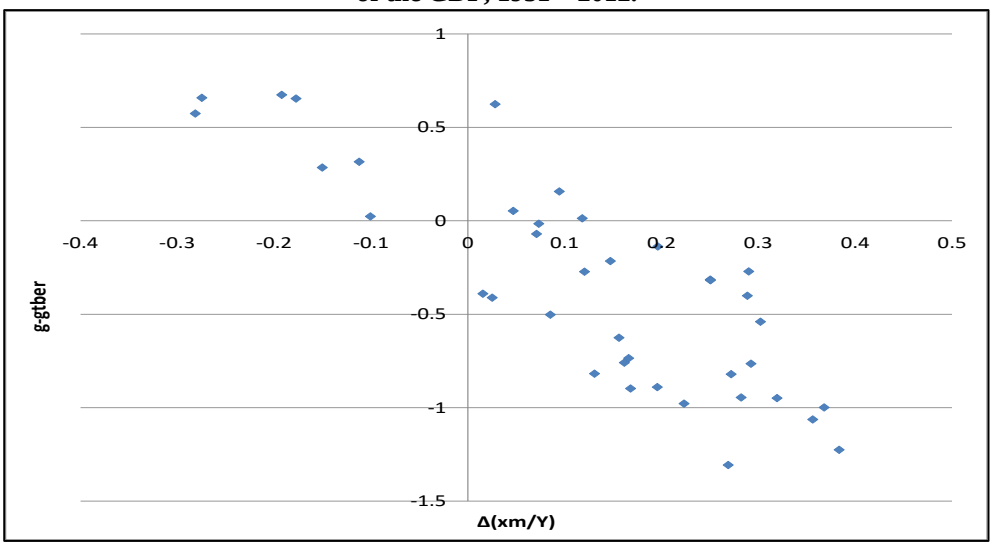
Excess of the effective rate of growth of the internal demand over the rate of growth of the internal demand consistent with a constant trade balance and annual average of the variation of the trade balance as a percentage of the GDP, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

Figure 2.12

Excess of the effective rate of growth over the rate of growth consistent with a constant trade balance and annual average of the variation of the trade balance as a percentage of the GDP, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

Moreover, we estimate the following equation:

$$[(ef - eq)^i]^j = \lambda_0^i + \lambda_1^i \Delta\left(\frac{xm}{Y}\right) + v \qquad \text{for } i = di, g \text{ and } j = 0,1 \qquad (2.2)$$

where *(ef – eq)* is the excess of the effective over the consistent with a constant trade balance position rates of growth, of the internal demand and aggregate income for each overlapped sub-period; for *j = 0* the differences are just the differences and for *j = 1* the differences are weighted by the real exchange rate elasticity gotten through the estimation of equation (2.1) for each overlapped sub-period, when *j = 0* the real exchange rate elasticity was not statistically different from zero and when *j = 1* the real exchange rate elasticity was statistically different from zero; λ_k^i are the parameters to be estimated, $\Delta\left(\frac{xm}{Y}\right)$ is the average of the annual change of the trade balance position as a percentage of the GDP for each overlapped sub-period, and *v* is a white noise. We expect a value equal to zero for λ_0^i and a negative one for λ_1^i, so if $\Delta\left(\frac{xm}{Y}\right)$ is equal to zero, $[(ef - eq)^i]^j$ will be equal to zero, whilst if $\Delta\left(\frac{xm}{Y}\right)$ is higher/lower than zero implies that $[(ef - eq)^i]^j$ is lower/higher than zero. We present the result of our estimations in Table (2.1):

Table 2.1 Estimation of the deviation of the effective rate of growth from the rate of growth consistent with a constant trade balance.

Dependent variable	$[(ef-eq)^{di}]^{j}$	$[(ef-eq)^{di}]^{j}$	$[(ef-eq)^{g}]^{j}$	$[(ef-eq)^{g}]^{j}$ [c]
Independent variable	Parameter	Parameter	Parameter	Parameter
Constant	0.05** (0.85)	0.07** (0.80)	-0.05** (-0.97)	-0.01** (-0.19)
$\Delta\left(\frac{xm}{Y}\right)$	-2.49* (-9.69)	-2.69* (-9.09)	-1.97* (-7.62)	-2.28* (-6.36)
MA(1)		1.05* (22.52)		1.29* (42.99)
MA(2)		0.93* (33.21)		0.96* (44.27)
R^2	0.72	0.90	0.61	0.90
Jarque-Bera test	1.45	0.01	1.48	0.23
LM test (F statistics)	21.41[a]	0.06	25.69[a]	0.03
White test (F statistics)	1.57	0.44	3.29[b]	2.31[b]
Ramsey Reset test	0.15	2.55	0.01	0.44
Observations	39	39	39	39

Source: Author's elaboration using data from INEGI, ECLAC, World Penn Table and Hofman (2000).
t values between parenthesis.
* Statistically significant at the 1% level.
** No significant.
[a] There is autocorrelation at the 1% level.
[b] There is heteroscedasticity at the 5% level.
[c] White heterocedasticity-consistent standard errors and covariance.

As it can be seen, the estimated parameters have the expected signs, however, our estimated errors exhibit serial autocorrelation for the case of the rate of growth of the internal demand and autocorrelation and heteroscedasticity for the case of the aggregate rate of growth. However, when we estimate the equations as a MA equation of order two, the estimated parameters still have the expected signs and there is no evidence of autocorrelation in both cases, for the case of the aggregate rate of growth there is still evidence of heteroscedasticity in the estimated errors but the statistical significances do not change if we use white heterocedasticity-consistent standard errors and covariance.

Now we want to disaggregate the percentage contribution of the autonomous change in the rate of growth of the imports, the real exchange rate, the exports and the

economic capacity in the determination of the rates of growth of the internal demand consistent with a constant trade balance position and of the rate of growth consistent with a constant trade balance position; we present our results in Table (2.2).

As it can be seen from Table (2.2), from the sub-period 1951 – 1974 to the sub-period 1969 - 1992, part of the state-led industrialization period, the capital accumulation and the consequently generation of a high rate of growth of the economic capacity (5.92% in average) contributed with 81.97% of the 5.63% value of the rate of growth of the internal demand consistent with a constant trade balance position, and with the 76.60% of the 5.78% value of the rate of growth consistent with a constant trade balance position. In contrast, we can see that from 1970 – 1993 to 1976 - 1999, in which capital accumulation and the economic capacity exhibited a strong slowdown (the last one was decreased to an annual average of 3.73%), exports were a bit increased (from 8.26% to 10.83%) and they contributed with 34.96% of the 3.10% value of the rate of growth of the internal demand consistent with a constant trade balance position, and with 50.53% of the 3.77% value of the rate of growth consistent with a constant trade balance position, it is worth to note that both rates of growth were lower than the corresponding to the previous sub-period; it means that the bit increase of the rate of growth of the exports was not enough in order to compensate the fall of the rate of growth of the economic capacity. Finally, from 1977 – 2000 to 1989 - 2012, during the export-led growth model, exports, whose average rate of growth was 9.41%, contributed to 90.80% of the 1.70% value of the rate of growth of the internal demand consistent with a constant trade balance position, and with 88.90% of the 2.81% of the rate of growth consistent with a constant trade balance position; it means that the use of the exports as the engine of the growth

process was not enough in order to reinsert to the Mexican economy in a path of high economic growth.

Table 2.2 Decomposition of the rates of growth consistent with a constant trade balance.

Rate of growth of the internal demand consistent with a constant trade balance position.					
Sub-period	Autonomous change in the rate of growth of the imports (% contribution)	Real Exchange Rate (% contribution)	Exports (% contribution)	Economic Capacity (% contribution)	Rate of growth (average)
1951 - 74 to 1969 - 92	-5.48%	-1.40%	24.91%	81.97%	5.63%
1970 - 93 to 1976 - 99	-2.49%	3.71%	34.96%	63.82%	3.10%
1977 - 00 to 1989 - 12	-14.14%	-11.98%	90.80%	35.31%	1.70%
Rate of growth consistent with a constant trade balance position.					
Sub-period	Autonomous change in the rate of growth of the imports (% contribution)	Real Exchange Rate (% contribution)	Exports (% contribution)	Economic Capacity (% contribution)	Rate of growth (average)
1951 - 74 to 1969 – 92	-4.88%	-1.50%	29.78%	76.60%	5.78%
1970 - 93 to 1976 - 99	-2.74%	2.85%	50.53%	49.36%	3.77%
1977 - 00 to 1989 – 12	3.22%	-2.09%	88.90%	9.98%	2.81%

Source: Author's elaboration using data from INEGI, ECLAC, World Penn Table and Hofman (2000).

It is important to note, as it was mentioned previously in the explanation of our theoretical model in Chapter 1, that the slowdown of the economy is even worse for the case of the internal demand for domestic goods; it has to do with three factors: a) on one hand the lower rate of growth of the internal demand with respect to the exhibited by the exports means that the export multiplier of the internal demand was decreasing over the time; b) the slowdown of the rate of growth of the economic capacity may have contributed to the increase of the income elasticity of demand for imports and therefore to the decrease of the economic capacity multiplier of the internal demand, and c) the

specialization in the maquila industry and the elimination of an industrial policy contributed to an accelerated increase of the importation of capital goods and intermediate goods and then to a reduction of the economic capacity multiplier of the internal demand. As it was indicated in Chapter 1, for the economy as a whole, the exports multipliers of the internal demand and the GDP could exhibit a different behavior because it could be possible that whilst the first one is decreasing the second one is constant. So, in Table (2.3) we present the export and economic capacity multipliers of the rates of growth of the internal demand consistent with a constant trade balance position and of the GDP consistent with a constant trade balance position. As it can be seen, the export multiplier of the internal demand was 0.19 on average from 1951 – 1974 to 1969 - 1992, then it was decreased to 0.12 from 1970 – 1993 to 1976 – 1999, and to 0.10 from 1977 – 2000 to 1989 – 2012; on the other hand, the economic capacity multiplier exhibited a strong decrease from 1970 – 1993 to 1976 - 1999 with respect to its exhibited value from 1951 – 1974 to 1969 - 1992 (from 0.86 to 0.60), and then it was stronger reduced during from 1970 – 1993 to 1989 - 2012 (to 0.11). In contrast, the export multiplier of the rate of growth was a more or less stable, it was equal to 0.23 from 1951 -1974 to 1969 – 1992, then it was equal to 0.20 from 1970 - 1993 to 1976 – 1999, and it was equal to 0.26 from 1977 – 2000 to 1989 - 2012; but the economic capacity multiplier of the rate of growth followed the behavior of the economic capacity multiplier of the internal demand, it was equal to 0.82 from 1951 – 1974 to 1969 – 1992, then it was equal to 0.54 from 1970 – 1993 to 1976 – 1999, and it was equal to 0.09 from 1977 – 2000 to 1989 – 2012.

Table 2.3 Multipliers of the rates of growth consistent with a constant trade balance.

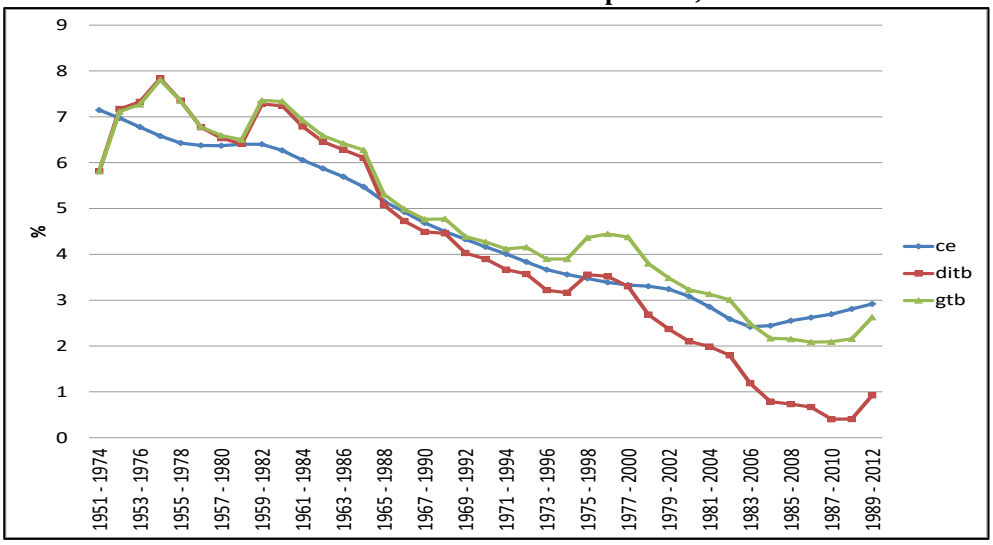
	Export multiplier of the internal demand (average)	Economic capacity multiplier of the internal demand (average)	Export multiplier of the GDP (average)	Economic capacity multiplier of the GDP (average)
1951 - 74 to 1969 – 92	0.19	0.86	0.23	0.82
1970 - 93 to 1976 - 99	0.12	0.60	0.20	0.54
1977 - 00 to 1989 – 12	0.10	0.11	0.26	0.09

Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

In base to our previous results we can say that the rates of growth of the internal demand consistent with a constant trade balance position and of the GDP consistent with a constant trade balance position are more correlated with the rate of growth of the economic capacity than with the rate of growth of the exports (see Figures (2.13) and (2.14)). So, the implication is that the generation of economic capacity through capital accumulation is an important device in order to increase the rates of growth of the internal demand and of the GDP consistent with a constant trade balance. The simple use of the exports as an engine of the growth process without an economic policy oriented to the industrialization of the economy could have a low effect on the relaxation of the external restriction to the growth of the Mexican economy.

Figure 2.13

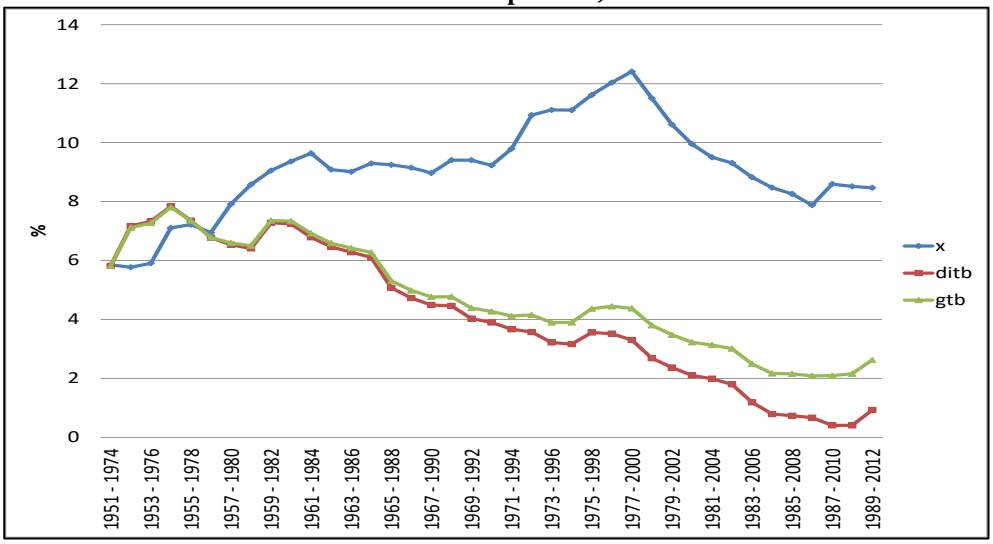
Rates of growth of the economic capacity, and of the internal demand and GDP consistent with a constant trade balance position, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

Figure 2.14

Rates of growth of the exports, and of the internal demand and GDP consistent with a constant trade balance position, 1951 – 2012.



Source: Author's elaboration using data from the INEGI, ECLAC, World Penn Table and Hofman (2000).

2.4. Final remarks

As it was indicated in Chapter 1, we think that exports are not the only variable that can be used in order to relax the external constraint to the grow of the economies and also it can be important to take into account the economic capacity in order to improve the estimation of the income elasticity of demand for imports.

Despite that Thirlwall's Law has been validated for a huge number of applied papers, we think that there is a problem because the estimation of the income elasticities of demand for imports could be biased due to an omitted variable problem. In these previous studies, it is usual to find that developing economies exhibit lower income elasticities that developed economies, but it is counterintuitive; as it was clearly explained by Prebisch (1950, 1959 and 1962) a key problem of developing economies is that their income elasticities of demand for imports tend to be higher than those of developed economies. We think that the incorporation of the economic capacity of the economies improves the estimation of the income elasticity of demand for imports.

In the Mexican case, previous studies indicated that the main explanation of the slowdown in its rate of growth after the Debt crisis of 1982 was a substantial increase of the income elasticity of demand for imports. According to our results, however, whilst it is true that the income elasticity was increased from the mid-seventies the main explanation of the fall of the rate of growth consistent with a constant trade balance position is the strong reduction of the economic capacity due to the low investment regime exhibited in the Mexican economy since the first years of the eighties.

However, it is worth to indicate that we do not think that exports are not important at all, exports are necessary for the economies because they are a source of foreign

exchange, but we think that investment is more important in the growth process of the economies because as it has been explained for a great number of economists the growth path of the economies depends crucially of capital accumulation.

CHAPTER 3

THE ENDOGENEITY OF THE NATURAL RATE OF GROWTH, THE RELEVANCE OF THE ECONOMIC CAPACITY AND A NEW WAY OF ESTIMATION.

3.1 Introduction.

Another important issue besides the rate of growth consistent with a constant trade balance position is the natural rate of growth. It is important due to two motives: one theoretical and one empirical. According to Harrod (1939) the rate of growth of the economies fluctuate around their natural rates of growth. When an economy is exhibiting an expansion the natural rate of growth is the upper limit of the rate of growth, and when the economy is exhibiting a depression, there are some mechanisms working in order to increase the rate of growth in the direction of the natural rate of growth, although in any case, nor when there is an expansion nor when there is a depression, there is nothing that could ensure the stability of the rate of growth at the level of the natural rate of growth.

On the other hand, according to some interpretations, the natural rate of growth is the rate of growth necessary in order to maintain a constant unemployment rate. It is important to an empirical level because it could be helpful in order to identify if the economy can generate the necessary conditions in order to create enough job positions for the growing population of the economies.

León-Ledesma and Thirwall (1998) postulated, in opposition of the general consensus, that the natural rate of growth is endogenous to the rate of growth itself through the endogeneity of both of its components, the rate of growth of population (employment) and the rate of growth of the labor productivity. It is very important to specify that Harrod (1939) used the rate of growth of the population as a component of

the natural rate of growth whilst it looks like León-Ledesma and Thirlwall (1998) are using the rate of growth of the employment. It is true that in the context of a constant unemployment rate, it could be irrelevant to use a distinction between the rate of growth of the population and the rate of growth of the employment, but we think that this distinction is very important, especially in economies with unlimited supply of labor, in which in the extreme the rate of growth of the population could be constant and anyway the natural rate of growth, taking as reference to the rate of growth of the employment, could be positive.

Moreover, we consider that the idea of the endogeneity of the natural rate of growth to the rate of growth itself is very interesting because in effect it could be an evidence of the effective demand problems of the economies. But again, whilst León-Ledesma and Thirlwall (1998) indicated the existence of different growth regimes which can be reflected in a normal natural rate of growth and an expansive natural rate of growth, we think that in the context of economies with unlimited supply of labor, the normal natural rate of growth itself is endogenous and the same can be said for the expansive natural rate of growth. Both of them, and even a third one that we call the depressive natural rate of growth, are endogenous to the capital accumulation and then to the investment coefficient of the economies. So, if the natural rate of growth is composed by the rate of growth of the employment and the rate of growth of the labor productivity, if there is not capital accumulation and there is not an increase of the labor productivity, the normal natural rate of growth could be equal to zero.

So, the objective of this chapter is to show that in the context of economies with unlimited supply of labor, as usually the developing economies are, the depressive,

normal and expansive natural rates of growth are endogenous to the investment coefficient of the economies and specifically to the rate of growth of the economic capacity, whilst the expansive and depressive natural rates of growth are also endogenous to the utilization coefficient of the economic capacity of the economies. Beside it, we develop a new way to estimate the normal, natural and depressive natural rates of growth that takes into account the utilization coefficient of the economic capacity of the economies.

This chapter is divided in four sections considering this introduction, in section 2 we review the empirical literature about the importance of the natural rate of growth from the perspective of the debated that have place during the 1950s between the two Cambridge schools, the Massachusetts, USA, and the Cambridge, England. For both Schools the natural rate of growth was considered exogenous in the long run, although for the Cambridge England School it could be endogenous to the rate of growth at least in the short run. Then we review the idea of the endogeneity of the natural rate of growth postulated by León-Ledesma and Thirlwall (1998); also we analyze some critics to this idea postulated by Boggio and Seravalli (2002) and Boggio (2012). Then we develop a model in which the depressive, normal and expansive natural rates of growth are endogenous to the capital accumulation, and specifically to the rate of growth of the economic capacity, whilst the depressive and expansive natural rates of growth are endogenous to the utilization coefficient of the economic capacity; besides it, we develop a simple methodology in order to estimate the depressive, normal and expansive natural rates of growth. In the section 3 we apply our methodology in order to estimate the

depressive, normal and expansive natural rates of growth of Mexico for the period 1974 – 2012, and finally in section 4 we present our final remarks.

3.2 The endogeneity of the natural rate of growth: theoretical discussion and a Harrodian extension.

Sir Roy Harrod was the first who indicated the existence of the *natural rate of growth*[22], according to him:

> "Alongside the concept of warranted rate of growth we may introduce another, to be called the natural rate of growth. This is the maximum rate of growth allowed by the increase of population, accumulation of capital, technological improvement and the work/leisure preference schedule, supposing that there is always full employment in some sense." (Harrod 1939: 30).

Harrod (1939) assumed that the natural rate of growth was an exogenous value composed by the sum of an exogenous rate of growth of the population (*n*) and of an exogenous rate of growth of the labor productivity (*p*).

On the other hand, Harrod (1939) defined the *warranted rate of growth* as "…that rate of growth which, if it occurs, will leave all parties satisfied that they have produced neither more nor less than the right amount." (Harrod 1939: 16); whilst the proper

[22] Although it has been indicated that it was Keynes the first who considered the idea of the natural rate of growth "…interestingly Keynes alluded to the idea [of the natural rate of growth] two years previously in a lecture to the Eugenic Society in 1937 on the economic consequences of a declining population… There, he expressed the view that if the growth of population fell to zero, the growth of demand for savings (with a given capital-output ratio) may not match the supply of savings (given the propensity to save), leading to demand deficiency. This is a clear anticipation of the idea in Harrod that the natural rate of growth may fall below what Harrod called the warranted growth rate, leading to secular stagnation." (León-Ledesma and Thirlwall 1998: 3).

warranted rate of growth is the "…warranted rate which would obtain in conditions of full employment…" (Harrod 1939: 30).

For Harrod (1939), the main problem of the economic system was that there is nothing that can guarantee the equality between the natural rate of growth and the proper warranted rate of growth of the economies, and that this inequality tendency produces some specific problems depending on which one is higher:

> "The system cannot advance more quickly than the natural rate allows. If the proper warranted rate is above this, there will be a chronic tendency to depression; the depressions drag down the warranted rate below its proper level, and so keep its average value over a term of years down to the natural rate. But this reduction of the warranted rate is only achieved by having chronic unemployment.
>
> The warranted rate is dragged down by depression; it may be twisted upwards by an inflation of prices and profit. If the proper rate is below the natural rate, the average value of the warranted rate may be sustained above its proper level over a term of years by a succession of profit booms." (Harrod 1939: 30).

In reference to the problem about the inequality between the natural rate of growth and the proper warranted rate of growth, in the 1950s, there was a debate between the two Cambridge Schools, the Massachusetts, USA, and the Cambridge, England. For both of them, the problem raised by Harrod (1939) was not a problem, or at least, it had a solution in such a way that the mentioned inequality could be eliminated in the long run.

In the case of the Cambridge, Massachusetts neoclassical school, the rate of growth of the income by effective units of labor ($\hat{y}^E$) is a positive but decreasing function

of the difference between the steady state income per effective units of labor (y_*^E) and the income per effective units of labor (y^E):

$$\hat{y}^E = f(y_*^E - y^E) \qquad \text{with } f(0) = 0 \text{ and } f' > 0 \text{ and } f'' < 0 \qquad (3.1)$$

The reasoning behind the equation (3.1) is that y^E is a positive function of the capital per effective units of labor (k^E) which exhibits decreasing marginal productivity, so assuming a constant saving rate, a decreasing rate of return on the capital implies a decreasing rate of growth of capital accumulation and then a decreasing rate of growth of y^E. Now, given that the aggregate income is equal to the income per effective units of labor times the effective units of labor:

$$Y = y^E \cdot (AL) \qquad (3.2)$$

the rate of growth of the aggregate income, or the proper warranted rate of growth[23], is equal to $\hat{y}^E$ plus the rate of growth of the technology (β) and the rate of growth of the population (n)[24]:

$$\hat{Y} = \hat{y}^E + \beta + n \qquad (3.3)$$

[23] It is assumed that the Say's Law is fulfilled and therefore there are never problems of effective demand.

[24] It is assumed that the unemployment rate is always constant.

therefore, using the equation (3.1) we can say that the proper warranted rate of growth is a positive but decreasing function of the difference between the steady state income per effective units of labor (y_*^E) and the effective income per effective units of labor (y^E):

$$\hat{Y} = h(y_*^E - y^E) \qquad \text{with } h(0) = \beta + n \text{ and } h' > 0 \text{ and } h'' < 0 \qquad (3.4)$$

so, in the long run the proper warranted rate of growth is equal to the natural rate of growth. It is worth to note that assuming the existence of competitive markets and an infinite range of possible combinations between labor and capital, the increase of k^E is ensured by the endogenous variation of the ratio wage by effective unit of labor to rate of return, and moreover, the long run steady state condition exists, is unique and, is stable.

In Figure (3.1) it is presented the long run adjustment of the proper warranted rate of growth and the natural rate of growth, any discrepancy is corrected by the rate of growth of the capital per effective units of labor itself which exhibits a decreasing behavior.

For the Cambridge England Keynesian school, and specifically, for Kaldor (1957) the rate of growth of the labor productivity ($\hat{y}$) was a positive but decreasing function of the rate of growth of the capital per worker (k), i.e. the Kaldor's technical progress function:

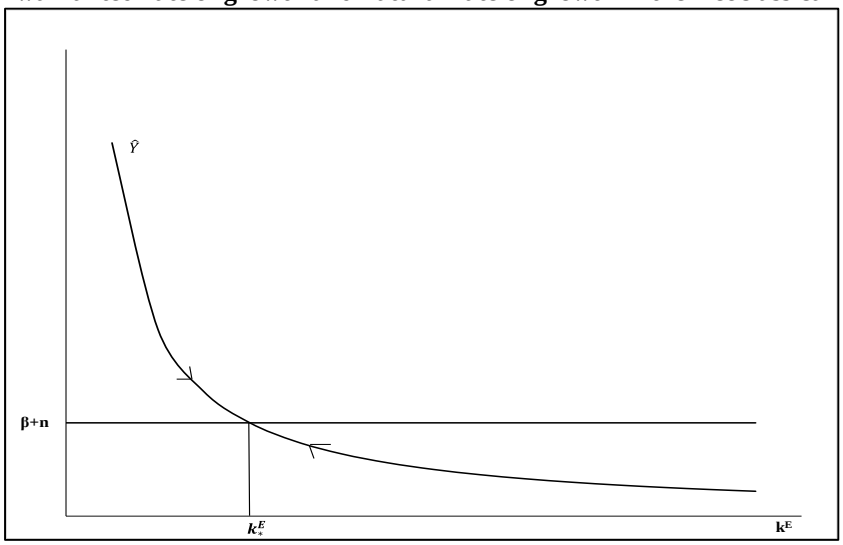
$$\hat{y} = y(k) \qquad \text{with } y(0) = y^0,\ y' > 0 \text{ and } y'' < 0 \qquad (3.5)$$

where y^0 is the autonomous rate of growth of the labor productivity, therefore, the natural rate of growth was also a positive but decreasing function of the rate of growth of the capital per worker:

$$\hat{Y} = \hat{y} + n = \varphi(\hat{k}) \qquad \text{with } \varphi(0) = y^0 + n,\ \varphi' > 0 \text{ and } \varphi'' < 0 \qquad (3.6)$$

Figure 3.1

Proper warranted rate of growth and natural rate of growth in the Neoclassical model.



On the other hand, the saving ratio is a function of the income distribution, or specifically, a function of the profit share of the economy (Π/Y):

$$\frac{S}{Y} = S\left(\frac{\Pi}{Y}\right) \qquad \text{with } S(0) = \left(\frac{\Pi}{Y}\right)^0,\ S' > 0, \text{ and } S'' = 0 \qquad (3.7)$$

Moreover, the investment ratio also is a function of the profit share of the economy, but assuming a linear equation, the intercept and the slope of the linear equation also are a positive function of the output-capital ratio (*K/Y*):

$$\frac{I}{Y} = \left(\frac{I}{Y}\right)^{0} + \Theta\left(\frac{\Pi}{Y}\right) \qquad (3.8)$$

where

$$\left(\frac{I}{Y}\right)^{0} = \Omega\left(\frac{Y}{K}\right) \qquad \text{with } \Omega' > 0 \qquad (3.8')$$

and

$$\Theta = \Theta\left(\frac{Y}{K}\right) \qquad \text{with } \Theta' > 0 \qquad (3.8'')$$

It is important to note that in this model it is assumed "full employment" in the strictly Keynesian sense, it means:

> "…a state of affairs in which the short-period supply of goods and services in the aggregate is inelastic and irresponsive to further increases in monetary demand. This need not necessarily imply the full employment of labour except in a developed economy where the available capital equipment is sufficient or more than sufficient to employ the whole of the available working force." (Kaldor 1957: 593).

Moreover, with respect to the investment it is assumed:

> "…(i) that given the (expected) rate of profit on capital, entrepreneurs desire to maintain a constant relationship between the amount of capital invested and their turnover; (ii) that this relationship between desired capital and turnover is an increasing function of the expected rate of profit on capital; (iii) that the investment decisions of each 'period' are governed by the condition that actual capital is to be brought into line with desired capital, the length of the 'period' being so defined as to make it technically feasible to eliminate in one period the backlog of investment (the difference between desired and actual capital) existing at the beginning of the period; (iv) that entrepreneurs expect the same growth in turnover in the coming period as was actually attained in the previous period; (v) that they expect to obtain the same margin of profit on turnover in the coming period as actually obtained in the previous period." (Kaldor 1957: 600 – 601).

So, the working of the model can be described as follows: given the market conditions, any discrepancy between the aggregate supply and the aggregate demand is eliminated through changes in the real wage, it means through changes in the income distribution, then it results in a determination of the investment coefficient and consequently in a determination of the rate of growth of the capital per worker, it means that there is a parallel determination of the natural rate of growth, through equation (3.6) and of the proper rate of growth, through equations (3.7) and (3.8). If the resulting rate of growth of the economy is higher than the rate of growth of the capital, then the output-capital is changed and also equation (3.8) is changed through changes in equations (3.8') and (3.8''). Then, there has to be a new modification of the income distribution in order to produce a new proper warranted rate of growth of equilibrium. It can be shown that

this process is repeated to the point in which the rate of growth of the labor productivity is equal to the rate of growth of the capital per worker. So, in the long run the proper warranted rate of growth and the natural rate of growth are equal and unique. Assuming that the rate of growth of the labor productivity is equal to the rate of growth of the capital per worker and solving the equation (3.6) for the rate of growth of the aggregate output we can get the long run natural rate of growth.

In Figures (3.2.1) and (3.2.2) it is presented the long run adjustment of the proper warranted rate of growth and the natural rate of growth, both of them are changing in such a way that in the long run, the rate of growth of the labor productivity is equal to the rate of growth of the capital per worker.

Figure 3.2.1

Determination of the proper warranted rate of growth in Kaldor's model.

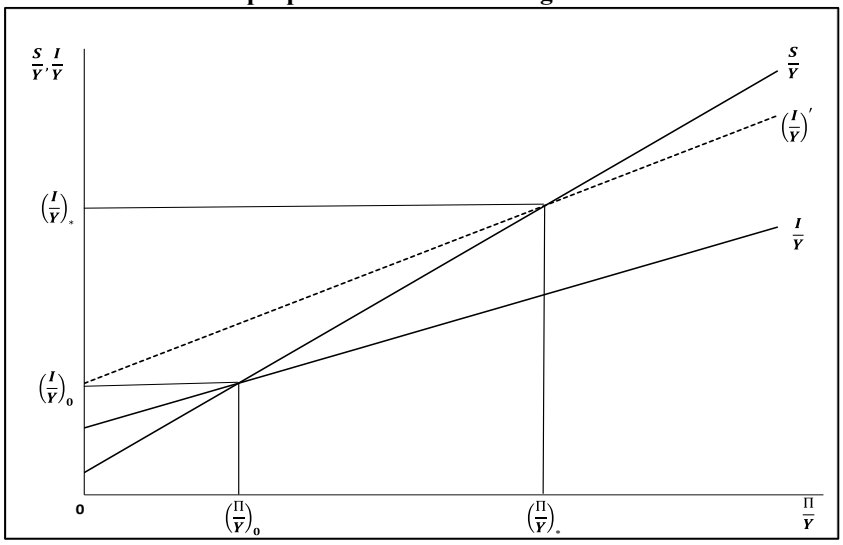
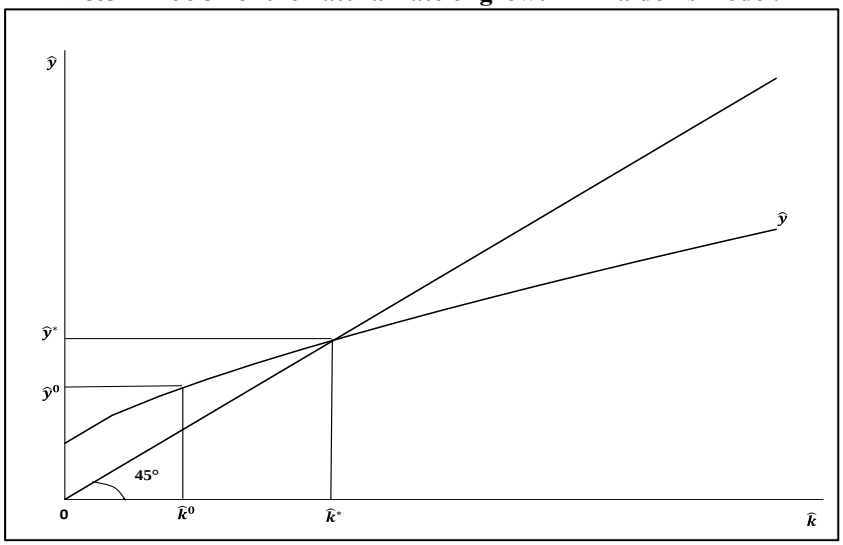


Figure 3.2.2

Determination of the natural rate of growth in Kaldor's model.



Now, for León-Ledesma and Thirlwall (1998), the natural rate of growth is not an exogenous variable but it is an endogenous one. The general idea about the endogeneity of the natural rate of growth is that the aggregate demand determines the aggregate supply in a range of rates of growth of full employment and that in most of the countries the restrictions over the demand tend to act much earlier than the restrictions over the supply.

Before we explain the idea about the endogeneity it is important to indicate that León-Ledesma and Thirlwall (1988) considered the natural rate of growth as the rate of growth for which the unemployment rate is constant. So, we are not considering, strictly speaking, the same definition of the natural rate of growth that we were using during our previous expositions about the Cambridge Schools, in whose cases we considered the natural rate of growth as the sum of the rate of growth of the population and the rate of growth of the labor productivity, although of course, both definitions could be the same.

Then, in order to prove the idea about the endogeneity of the natural rate of growth and based on the Okun's Law, Leon-Ledesma and Thirlwall (1998) estimated the next relationship:

$$g_t = \lambda_0 + \lambda_1 u_t \qquad (3.9)$$

where g is the rate of growth of the economy and u is the percentage variation of the unemployment rate. They assumed that λ_0 is the natural rate of growth in normal times. Now, in order to prove the endogeneity of the natural rate of growth they estimated the next equation:

$$g_t = \beta_0 + \beta_1 DU_t + \beta_2 u_t \qquad (3.10)$$

where DU is a dummy variable with value equal to one when $g>\lambda_0$ (from the previous equation) and 0 in otherwise. So, $\beta_0 + \beta_1$ is the natural rate of growth in expansive periods. The elasticity of the expansive rate of growth with respect to the normal rate of growth is different between countries and in a particular country could be different over the time. For example, Leon-Ledesma and Thirlwall (1998) indicated that it can be expected a lower elasticity of the expansive rate of growth with respect to the normal rate of growth for developed countries than for developing countries because it is more likely that in the developing countries there are more people outside the labor market but trying to go inside when the economy exhibits an expansive movement.

Boggio and Seravalli (2002) and Boggio (2012) criticized Leon-Ledesma and Thirlwall's idea about the endogeneity of the natural rate of growth. Their critique was theoretical and also with respect to the statistical procedure used in order to show the endogeneity of the natural rate of growth.

With respect to the theoretical critique, Boggio and Seravalli (2002) indicated that if we define the natural rate of growth as the rate of growth for which the unemployment rate is constant, even if we assume that the components of the natural rate of growth are increasing functions of the effective rate of growth there will be just a unique value for the natural rate of growth.

So suppose the following functional relationship of the rate of growth of the labor force (*n*) and of the rate of growth of the labor productivity (*p*):

$$n = n(g) \qquad \text{with } n(0) = n_0 > 0 \text{ and } 0 < n' < 1 \qquad (3.11)$$

$$p = p(g) \qquad \text{with } p(0) = p_0 > 0 \text{ and } 0 < p' < 1 \qquad (3.12)$$

where *g* is the rate of growth, and *n'* and *p'* are the first differences with respect *g*. Given equations (3.11 and 3.12) we can get the following functional relationship:

$$n + p = f(g) \qquad \text{with } f(0) = n_0 + p_0 > 0 \text{ and } 0 < f' < 1 \qquad (3.13)$$

And given the equation (3.13) we can get the following equality:

$$g_1 = n_1 + p_1 = f(g_1) \qquad (3.14)$$

and because $g - p$ exhibits the rate of growth of the labor demand whilst n is the rate of growth of the labor supply, g_1 as defined in equation (3.14) is the natural rate of growth. In effect, suppose a value of g lower than g_1, let say g_2, from (3.13) we can say that g_2 is corresponded with a given value $n_2 + p_2$ but $n_2 + p_2$ is not equal to g_2 but is higher, therefore:

$$g_2 < n_2 + p_2 = f(g_2)$$

and in consequence $g_2 - p_2$ is lower than n_2 and the unemployment rate is increasing. Now suppose a value of g higher than g_1, let say g_3, from (3.13) we can say that g_3 is corresponded with a given value $n_3 + p_3$ but $n_3 + p_3$ is not equal to g_3 but is lower, therefore:

$$g_3 > n_3 + p_3 = f(g_3)$$

and in consequence $g_3 - p_3$ is higher than n_3 and the unemployment rate is decreasing.

So, how is it possible to find more than one natural rate of growth as it is proposed by Leon-Ledesma and Thirlwall (2002)? According to Boggio and Seravalli (2002):

> "This possibility however raises serious difficulties: if *f* is continuous, it is necessary to explain why the effect of g on ($n + [p]$) is less than one to one… …for certain intervals of *g* and larger than one to one… …for certain other intervals." (Boggio and Seravalli 2002: 223).

Moreover, considering the equation (3.10):

> "…suppose an exogenous shock hits the economy, so that the error term is increased by [ε_t]. If as a consequence the division between the years with $g_t > [\beta_o]$ and the years with $[\beta_o] < g_t$ changes, as it is well possible, D will also change, hence it is not independent from the error term." (Boggio 2012: 11).

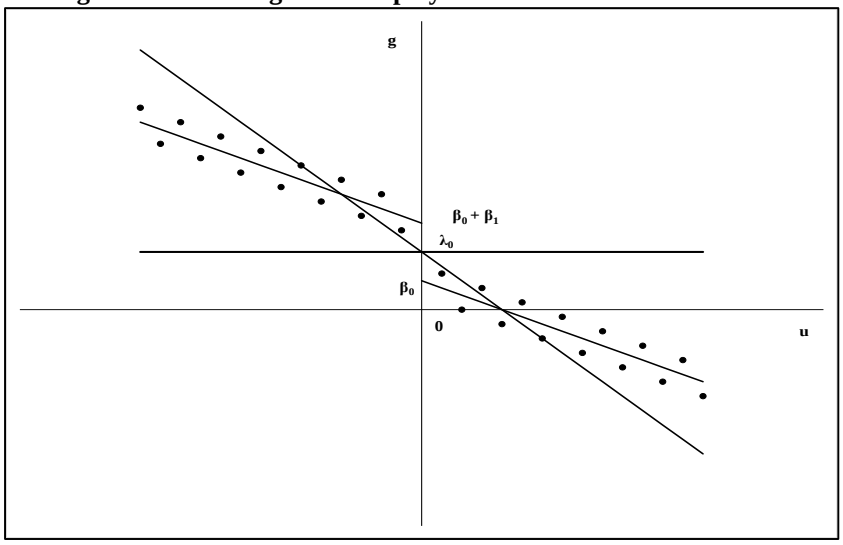
Therefore the estimations of the equation (3.10) tend to be biased.

With respect to the theoretical critique, Leon-Ledesma and Thirlwall (2002) argued that Boggio and Seravalli (2002) are wrong when they indicate that the idea about the endogeneity of the natural rate of growth can be represented through continuous functions of the rate of growth of the labor force and the labor productivity with respect to the rate of growth. Leon-Ledesma and Thirlwall (2002) indicated that they are in fact, assuming the existence of two growth regimes (see Figure 3.3) "…rather… …there are high and low *growth regimes* in which the natural rate of growth differs due to increased labor force growth and productivity growth." (Leon-Ledesma and Thirlwall 2002: 229).

However, with respect to the statistical procedure in order to show the endogeneity of the natural rate of growth, Leon-Ledesma and Thirlwall (2002) at least admitted that for cases in which the estimated error of the equation (3.10) are high,

Boggio and Seravalli's critique can be partially true, although for most of the cases this critique is not valid.

Figure 3.3
Relation between growth and change in unemployment in León-Ledesma and Thirlwall's model.



We think that Leon-Ledesma and Thirwall's hypothesis about the endogeneity of the natural rate of growth omits one important aspect, capital accumulation. Especially, it is important to consider the capital accumulation in the cases of the developing economies. It is true that according to Harrod (1939) there are two different rates of growth, warranted and natural, and they are independent of one another, but what happen if the economy exhibits an unlimited supply of labor as in Lewis' Model (see Lewis (1954))?[25]

[25] It is worth to indicate that if we consider the natural rate of growth as the rate of growth for which the unemployment rate is constant it could be difficult to introduce this concept in a Lewis world because given the unlimited supply of labor the unemployment rate would seem to be undefined. However, in the real world, especially in the world of the developing countries, we also find an unlimited supply of labor and nevertheless it has been possible to determine an unemployment rate through a methodology in which the unemployed workers are not working at all, nor in the formal sector nor in the informal sector, and that is the idea that we will be considering here.

From our point of view, it is possible to combine the effective demand problems, or the existence of different growth regimes, with the existence of an unlimited supply of labor in order to estimate the natural rate of growth in developing economies. After all, as it was indicated by Nurkse "…the general theme of capital formation. …lies at the very centre of the problem of development in economically backward countries. …[They] are underequipped with capital in relation to their population and natural resources." (Nurkse 1953: 1).

If we define the natural rate of growth as the rate of growth for which the unemployment rate is constant, and if there is no capital accumulation then the natural rate of growth of an economy characterized by an unlimited supply of labor will be equal to zero. Now, it is true that we can accept the existence of effective demand problems in developing economies, so if we characterize three possible scenarios according to the economic capacity utilization as expansive, normal, and depressive, we can define the proper warranted rate of growth as the rate of growth for which the economic capacity utilization is the normal one, and therefore, the natural rate of growth in normal times will be equal to the proper warranted rate of growth of the economy.

Our previous statement can be derived in the next way, assume that the production function of the economy is the next one[26]:

$$CE_t = \min(\sigma K_t, bL_t) \qquad (3.15)$$

[26] As it was shown by Lewis (1954), it is not necessary to assume that labor and capital are complementary inputs, it is enough to assume that the real wage is constant due to the existence of an unlimited supply of labor in order to derive a constant ratio capital-labor in the capitalist sector (see Ros 2004).

where *CE* is the economic capacity, *K* is the capital stock, *L* is the employment, and σ and *b* are the average productivities of capital and labor. The degree of capacity utilization is the *gap*:

$$gap_t = \frac{Y_t - CE_t}{CE_t} \qquad (3.16)$$

Assuming that the economy is restricted by the capital stock and that there is a normal degree of utilization, the rate of growth can be defined as:

$$g_t = ce_t = \hat{\sigma}_t + \hat{K}_t \qquad (3.17)$$

where $\hat{\sigma}$ is the rate of growth of the capital productivity and $\hat{K}$ is the rate of growth of the capital stock. Or we can express equation (3.17) as:

$$g_t = ce_t = \hat{\sigma}_t + \sigma \frac{I_t}{Y_t} \qquad (3.17')$$

And therefore, the proper warranted and the normal natural rates of growth are a function of the investment coefficient.

Moreover, given the equation (3.15) the labor demand function is:

$$L_t^D = \frac{Y_t}{CE_t} \cdot \frac{CE_t}{b} = \frac{(1 + gap_t)aK_t}{b} \qquad (3.18)$$

and the rate of growth of the labor demand is:

$$\hat{L}_t^D = \frac{gap_t}{1+gap_t} gapg_t + \hat{\sigma}_t + \hat{K}_t - \hat{b}_t = \frac{gap_t}{1+gap_t} gapg_t + \hat{\sigma}_t + \sigma \frac{I_t}{K_t} - \hat{b}_t \qquad (3.19)$$

where *gapg* is the rate of growth of the *gap* and $\hat{b}$ is the rate of growth of the labor productivity.

So, according to the equation (3.18) for a given value of *K*, the labor demand is a function of the *gap* level.

Now, we can assume that the labor supply is infinitely elastic to the given real wage. According to León-Ledesma and Thirlwall: "Labour supply is extremely elastic to demand. When the demand for labour is strong …participation rates rise. …hours worked increase. …[and] labour migration takes place in response to booming labour markets." (León-Ledesma and Thirlwall 2000: 438 – 439).

It is worth to note that Lewis anticipated this endogenous response of the labor supply, the difference is that Lewis endogeneized the industrial employment to the capital accumulation:

> "…new industries can be created, or old industries expanded without limit at the existent wage… For we have… …the farmers, the casuals, the petty traders and the retainers…
>
> …the wives and daughters of the household.
>
> …the increase in the population resulting from the excess of births over deaths…" (Lewis 1954: 142-143).

Moreover, "…capitalists can… …[encourage] immigration…" (Lewis 1954: 176). So we can think about two kinds of endogeneities of the natural rate of growth, following to Lewis (1954) there is an endogenous behavior of the labor supply to the investment coefficient, and following to León-Ledesma and Thirlwall (2000) there is an endogenous behavior of the labor supply to the growth regimes[27].

In order to formalize our previous idea, the equation (3.9) is modified in the following way:

$$g_t = \omega_0 + \omega_1 gap_t + \omega_2 u_t \qquad (3.20)$$

and then we can get the estimated values of the natural rates of growth as:

$$\begin{aligned} &expansive:\ en = \omega_0 + \omega_1 mxgap \\ &normal:\ nn = \omega_0 + \omega_1 agap \\ &depressive:\ dn = \omega_0 + \omega_1 mngap \end{aligned} \qquad (3.21)$$

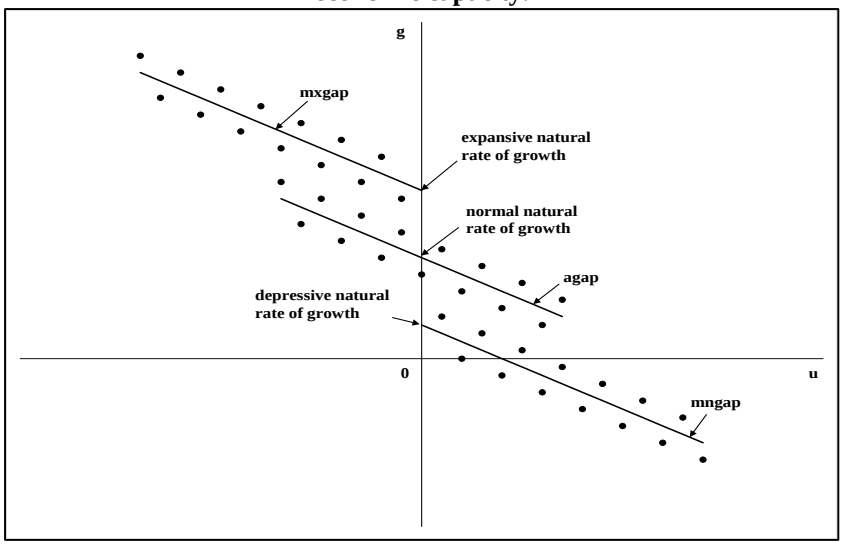
In Figure (3.4) we show our modified idea of the endogeneity of the natural rate of growth, as it can be seen, our graphic description is very similar to the graphic description shown in Figure (3.3) but now the corresponding values of the expansive,

[27] It is also worth to note that León-Ledesma and Thirlwall (2000) endogenize the natural rate of growth through the endogenous response of the rate of growth of the labor productivity to the effective rate of growth, i.e. the Verdoorn law; on the other hand, for Lewis "…it is unnecessary to distinguish between capital formation and growth of knowledge within the capital sector… the growth of productive capital and the growth of technical knowledge are treated as a single phenomenon…" (Lewis 1954: 152-153).

normal, and depressive natural rates of growth, are a function of a given value of the utilization of the economic capacity.

In the next section we apply our modified version of the determination of the natural rate of growth in the Mexican case for the period 1974 – 2012.

Figure 3.4
Relation between growth and change in unemployment given an average of the utilization of the economic capacity.



3.3 Investment, utilization gap and the endogeneity of the natural rate of growth: The case of Mexico.

There has been some studies about the endogeneity of the natural rate of growth in the case of Mexico (see Perrotini and Tlatelpa, 2003; Vogel, 2009; Libânio, 2009; Perrotini and Molerés, 2012 and Lanzafame, 2014)[28]. All of them support the hypothesis about the endogeneity of the natural rate of growth of Mexico. Perrotini and Tlatelpa (2003) found

[28] There has been also studies about the endogeneity of the natural rate of growth for another countries (see León-Ledesma and Thirlwall, 2000; León-Ledesma and Thirlwall, 2002; Perrotini and Tlatelpa, 2003; León-Ledesma, 2006; Oreiro et al, 2007; Libâno, 2009; Vogel, 2009; Dray and Thirlwall, 2011; Perrotini and Molerés, 2012 and Lanzafame, 2014) and for Italian regions (see Ciriaci, 2007; Lanzafame, 2009 and Lanzafame, 2010).

that for the period 1974 – 2000 the normal natural rate of growth of Mexico was equal to 3.86% whilst the expansive natural rate of growth was equal to 6.75%. According to Vogel (2009), the normal natural rate of growth of Mexico for the period 1986 – 2003 was equal to 2.64% whilst the expansive natural rate of growth was equal to 4.66%. Libânio (2009) got a normal natural rate of growth of Mexico equal to 2.57% and an expansive natural rate of growth equal to 4.40% for the period 1981 – 2003. Perrotini and Molerés (2012) found that the normal natural rate of growth of Mexico during the period 1974 – 2011 was equal to 3.33% whilst the expansive natural rate of growth was equal to 5.18%. Lanzafame (2014) found that for 22 OECD countries, including Mexico, the average of the normal natural rate of growth was equal to 3.02% whilst the expansive natural rate of growth was equal to 4.51 for the period 1960 – 2010.

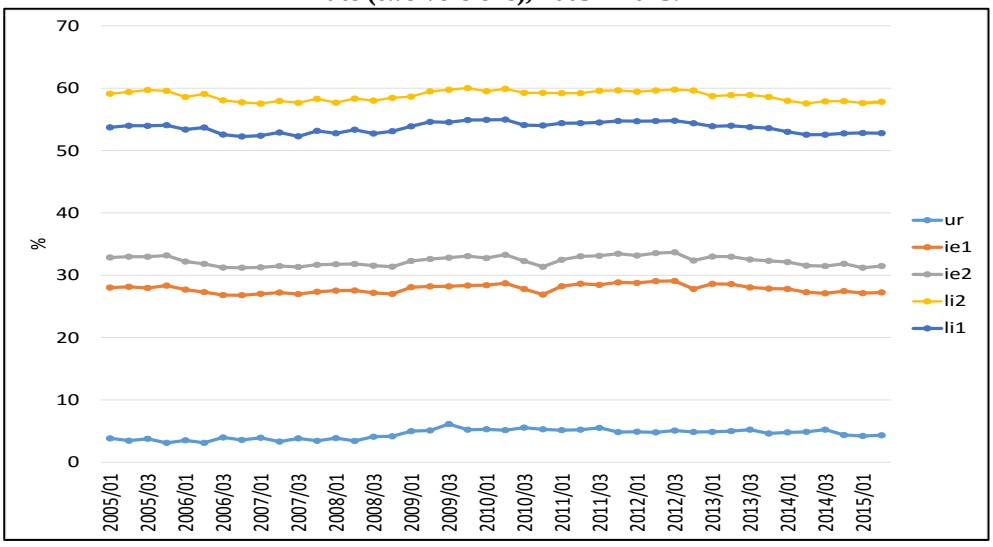
But any one of the previous studies have considered the relationship between the depressive, normal and expansive natural rates of growth and the rate of growth of the economic capacity nor the relationship between the growth regimes and the utilization coefficient of the economic capacity. The main objective of this section is to estimate the depressive, normal and expansive natural rates of growth of Mexico for the period 1974 – 2012 and to show that all of them are related to the rate of growth of the economic capacity and that the growth regimes are related with the utilization coefficient of the economic capacity.

As a first step, in Figure (3.5) we present the unemployment rate, two versions of the informal employment rate and two versions of the labor informality rate. As it can be seen, during the period 2005 – 2015 the average value of the unemployment rate (ur) was equal to 4.52%, but average value of the informal employment rate taking as reference

the total occupied population (*ie1*) was equal to 27.85% and it was equal to 32.30% if the reference is the non-agricultural occupied population (*ie2*); moreover, the average of the labor informality rate was equal to 58.79% if the reference is the total occupied population (*li1*), and it was equal to 53.68 if the reference is the non-agricultural occupied population (*li2*).

As it can be seen, although our data series just covers the period 2005 – 2015, we can say that the Mexican economy has been a kind of unlimited supply of labor economy and it would be difficult to say that Mexican economy was not an unlimited supply labor economy from 1974 to 2004. However, according to the Figure (3.6) there is a negative relationship between the annual variations of the unemployment rate (*u*) and the annual rate of growth for the period 1974 - 2012.

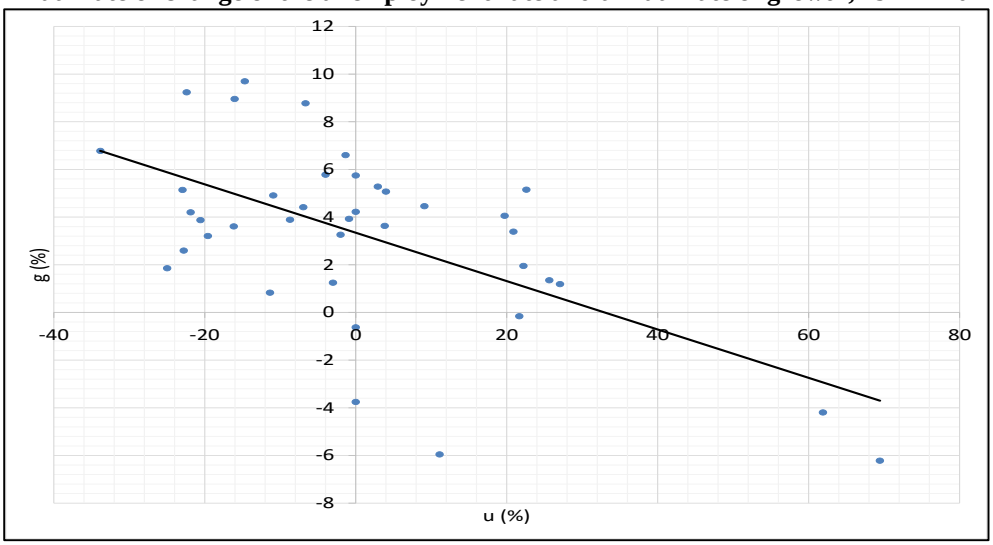
Figure 3.5
Unemployment rate, informal employment rate (two versions) and labor informality rate (two versions), 2005 – 2015.



Source: INEGI.
Note: The informal employment rate is the ratio informal employees to total employees in the case of the version 1 and the ratio informal employees to non-agricultural employees in the case of the version 2. The labor informality rate is the ratio informal employees plus employees working in formal firms without labor rights to total employees in the case of the version 1 and the ratio informal employees plus employees working in formal firms without labor rights to non-agricultural employees in the case of the version 2.

Figure 3.6

Annual rate of change of the unemployment rate and annual rate of growth, 1974 – 2012.



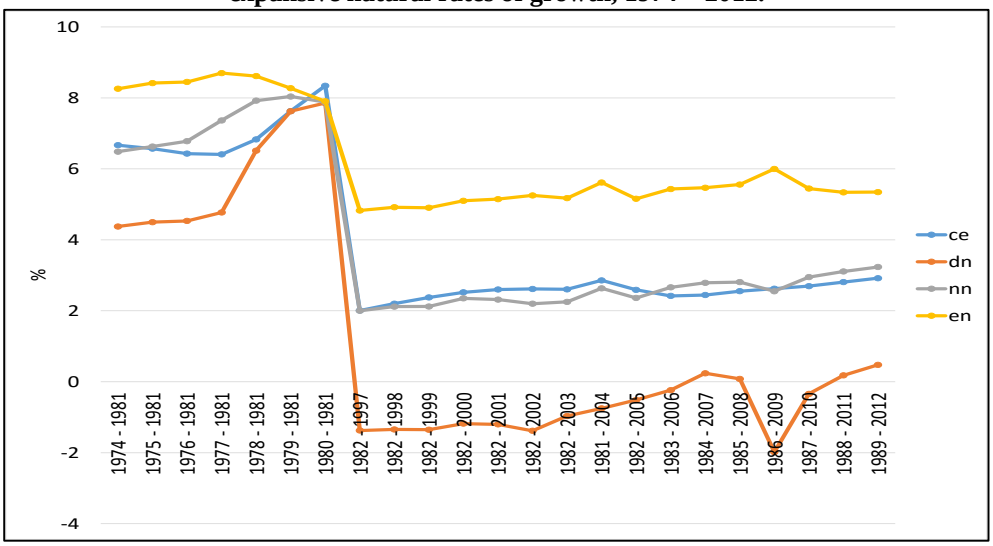
Source: Author's elaboration using data from INEGI.

So, as a second step we estimate the equation (3.20) for overlapped sub-periods of 24 years each one and then we calculate the depressive, normal and expansive natural rates of growth (*dn*, *nn* and *en* respectively) following the rule indicated in equation (3.21); we decide to use the rolling regressions technique because we want to show that the natural rates of growth have been following the behavior of the rate of growth of the economic capacity. We present our results in the Figure (3.7) in which also we incorporate the rate of growth of the economic capacity (*ce*). As it was mentioned in chapter 2, the rate of growth of the economic capacity of Mexico was strongly decreased after the Debt crisis of 1982, and as it is clear in the Figure (3.7) it was also reflected in a strong decrease in the depressive, normal and expansive natural rates of growth. From 1974 to 1981 the rates of growth of the economic capacity, and of the depressive, normal and expansive natural rates of growth were 6.67%, 4.38%, 6.48% and 8.26%. From 1980 to 1981 the respective values were 8.34%, 7.86%, 7.88% and 7.90%. From 1982 to 1997

the respective values were 2.01%, -1.38%, 2.00% and 4.83%. And finally, from 1989 to 2012 the respective values were 2.92%, 0.48%, 3.23% and 5.34%.

Figure 3.7[29]

Annual rates of growth of the Economic Capacity, and of the depressive, normal and expansive natural rates of growth, 1974 – 2012.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

Also, it is possible to show that the utilization coefficient of the economic capacity is related with the growth regimes of the Mexican economy. In Figures (3.8.1), (3.8.2), (3.8.3) and (3.8.4) we show the estimated relationships between the annual rate of growth and the annual rate of change of the unemployment rate for four of the sub-periods of our analysis[30].

So, we can say that the natural rate of growth is not just endogenous to the demand but also it is endogenous to the rate of growth of the economic capacity and then

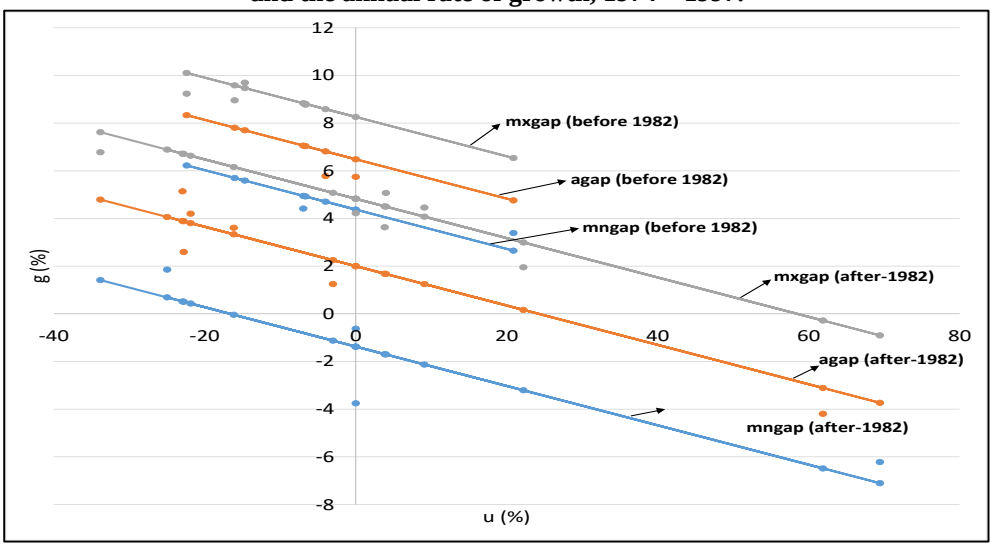
[29] A full description of the statistical properties of the regressions is presented in appendix III.

[30] We chose four of the sixteen sub-periods just for space, as it can be seen in the graphs, the growth regimes are related with the utilization coefficient of the economy.

to the investment coefficient. Our idea is that effective demand problems are present hand in hand with capital stock scarcity in the Mexican economy.

Figure 3.8.1

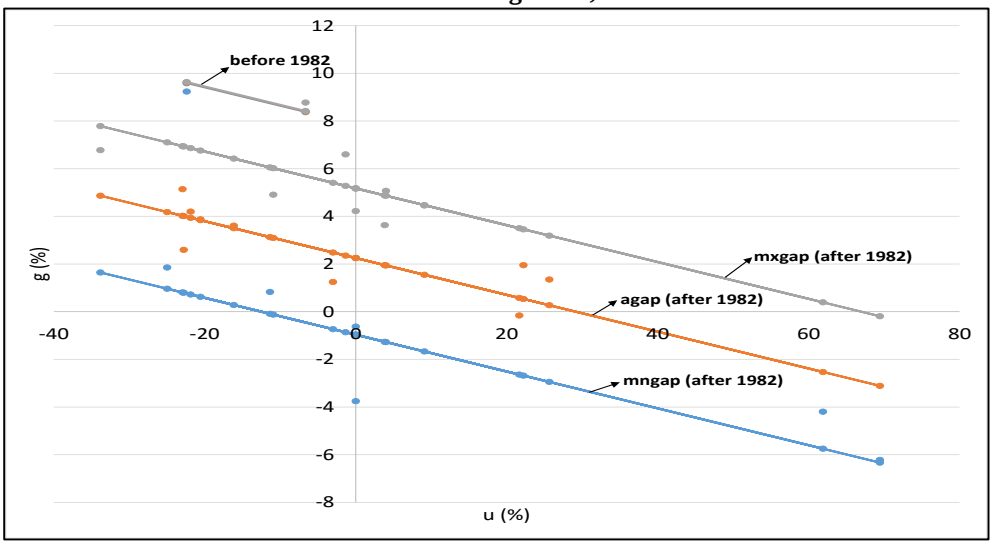
Estimated relationships between the annual rate of change of the unemployment rate and the annual rate of growth, 1974 – 1997.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

Figure 3.8.2

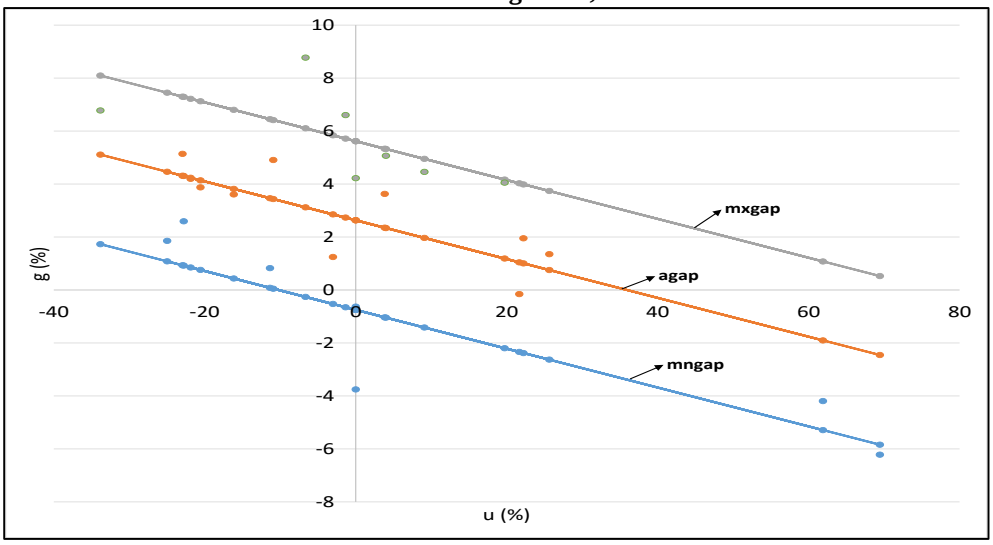
Estimated relationships between the annual rate of change of the unemployment rate and the annual rate of growth, 1980 – 2003.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

Figure 3.8.3

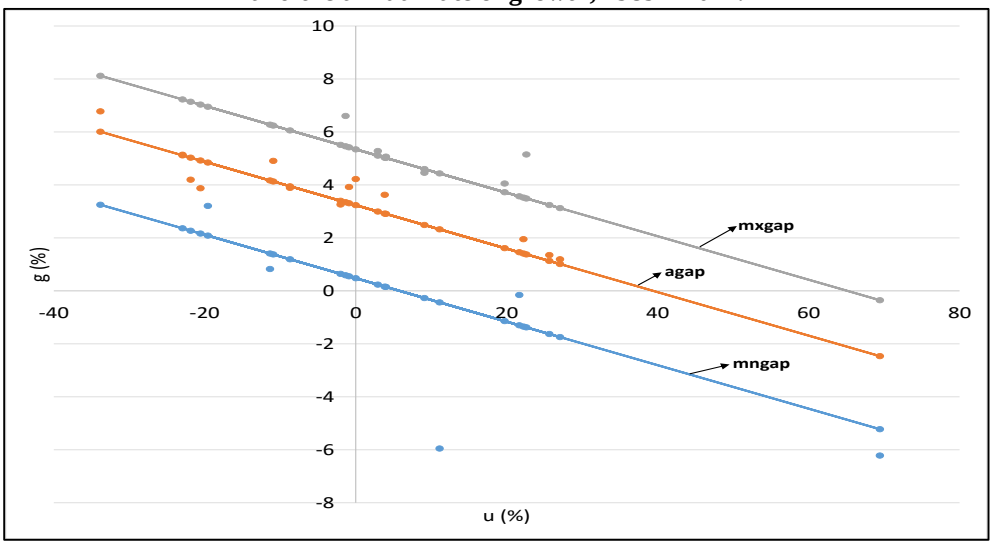
Estimated relationships between the annual rate of change of the unemployment rate and the annual rate of growth, 1981 – 2004.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

Figure 3.8.4

Estimated relationships between the annual rate of change of the unemployment rate and the annual rate of growth, 1989 – 2012.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

A related issue that can be derived from our estimations is the composition of the sub-periods between depressive, normal and expansive periods. As it can be seen in the Table (3.1), the Mexican economy has been changing into a "normal" economy from an

"expansive" economy, which also could be part of the explanation about the decrease in the rates of growth of the capital stock of the economic capacity.

Table 3.1 Depressive, normal and expansive periods of Mexico.

Sub-period	Number of depressive periods	Number of normal periods	Number of expansive periods
1974 – 1997	6	8	10
1975 – 1998	6	8	10
1976 – 1999	6	8	10
1977 – 2000	5	9	10
1978 – 2001	4	11	9
1979 – 2002	6	8	10
1980 - 2003	7	9	8
1981 – 2004	7	10	7
1982 – 2005	7	9	8
1983 – 2006	7	9	8
1984 – 2007	7	9	8
1985 - 2008	7	9	8
1986 – 2009	5	13	6
1987 – 2010	5	11	8
1988 – 2011	6	12	6
1989 - 2012	5	13	6

Source: Author's elaboration using the estimations of the equation (3.20) and the rule indicated in the equation (3.21).

3.4 Final remarks.

If we define the natural rate of growth as the rate of growth of the employment plus the rate of growth of the labor productivity and we assume that the economies have an unlimited supply of labor, as it is usual in the case of developing economies, then the natural rates of growth are not just endogenous to the rate of growth itself or to the growth regimes, as it was established by León-Ledesma and Thirlwall (1998), but they are also endogenous to the rate of growth of the economic capacity and then to the investment coefficient.

In the case of the developing economies, it could be expected that if there is no capital accumulation at all then the natural rates of growth will be equal to zero because

the rate of growth is restricted by the capital stock which is the scarce input. So, we can combine the effective demand problem postulated by León-Ledesma and Thirwall (1998) with what has been indicated by the developmental economists, for example Nurkse (1953) and Lewis (1954), as the main factor determining the rate of growth of developing economies, capital accumulation in order to determine the natural rates of growth of developing economies.

It is important to note that we consider that the effective demand problem is very important in the determination of the natural rates of growth because, for example, if there is a continuous sub-utilization of the economic capacity, then there can be a negative effect on the stimulus to invest and therefore it can result in a decrease of the natural rates of growth.

Some studies have determined the natural rates of growth for the Mexican case, but none of these related the natural rate of growth to the rate of growth of the economic capacity and then to the investment coefficient. According to our results, the depressive, normal and expansive natural rates of growth of Mexico were strongly decreased after the Debt Crisis of 1982 due to the strong reduction of the rate of growth of the economic capacity which in turn was a result of the strong reduction of the investment coefficient. Also, we find that the growth regimes are related to the utilization coefficient of the economic capacity and then the elasticities of the expansive and depressive natural rates of growth with respect to the normal rate of growth are related to effective demand problems.

Finally, it is important to indicate that whilst the Mexican economy was an "expansive" economy during the last part of the state-led industrialization period in

which the economic policy was used in order to promote the economic growth, during the neoliberal period, it has been a “normal” economy in which the economic policy has been used to maintain the fundamentals of the economy.

CHAPTER 4

GENERAL FINAL REMARKS: WHAT IS BEHIND THE STRONG DECREASE OF THE INVESTMENT COEFFICIENT IN MEXICAN ECONOMY AFTER 1982?

4.1 Introduction

In a recent paper about a debate about Thirlwall's law, Ros and Clavijo (2015) started their arguments with some questions:

> "Why Japan's economy grew faster than that of Britain in the first four decades of the postwar period? Why China's economy has grown over the last thirty years between 4 and 5 times faster than Mexico? Do these differences are due to differences in growth rates in the trade specialization pattern and the resulting differences in elasticities income from exports and imports? Or rather they have to do with the fact that the investment rate in Japan was much higher than that of Great Britain and that of China, more than twice that of Mexico?" (Ros and Clavijo 2015: 81).

As it was indicated in our previous chapters, our answers to Ros and Clavijo's questions are affirmative, it was mainly the strong reduction of the investment coefficient what is behind the strong reduction of the rate of growth of the Mexican economy after the Debt crisis of 1982. Of course, our point is not that exports are not important at all but we think that the investment coefficient is the main variable in order to relax the external restriction to grow. So our objective in this final chapter is to identify some of the factors behind the reduction of the investment coefficient and to use our previous theoretical developments in order to evaluate the importance of the economic policy in the occurrence of this phenomenon.

This chapter is divided in three sections considering this introduction, in section 2 we identify some of the main factors behind the strong reduction of the investment coefficient of the Mexican economy after the Debt Crisis of 1982; our analysis is focused in the general context of the liberalization process followed by the Latin American countries from the mid-eighties. In section 3 we present our final remarks.

4.2 Mexican economy in the context of the Latin American liberalization process.

Historically, developing countries had had the role of primary goods suppliers, but after the Great Depression, there were some changes in the international relationship of production that allowed to some developing countries to adopt an industrialization process; in the specific case of the Latin American economies:

> "…development experienced a turning-point during the 1930s. The contrast between 'before and after 1929' may often be exaggerated, but there is little doubt that the decade witnessed a closing toward international trade and finance, and a relative upsurge of import-substituting activities, primarily but not exclusively in manufacturing" (Díaz Alejandro 1984: 17)[31].

[31] Díaz Alejandro (1984) attributes to internal and external factors the performance exhibited by the Latin American countries during the 1930s. "This essay will view the economic performance of each country as the result of the magnitude of the exogenous external shock received, of the policy measures undertaken by domestic authorities to speed adjustment to those shocks and to seek external and internal balance, and of the resilience of local private agents in responding to the new constellations of profit opportunities, including those opened up by new technologies and products" (Díaz Alejandro 1984: 18); between the external factors that he mentioned are the higher dollar export price collapse comparative to the import prices with the consequent contraction of the export quantum during 1929-33, the increase of gold prices by US monetary authorities; the US support programmes for silver and agricultural commodities that in turn improved a few Latin American export prices; the Post-1933 German expansion that allow export diversification for several countries, as to products and markets; the sharp fall of the gross capital inflows; the dramatic increase of the debt service in real terms that compressed the import capacity; the shift of the marginal orientation of the direct foreign investment toward import substituting activities; the use of exchange controls and multiple exchange rates with the objective of discourage the remittances of profits; the inflow of refugee capital from Europe and the end of *laissez-faire* and of the commitment of leading countries to relatively free trade. See also Ocampo and Parra (2006) who explained the performance of the

In fact, it is worth to note that the Latin America's development strategy did not consist just in an import substitution strategy but moreover "…the region embraced a paradigm that placed the developmental state at the center of the strategy, with industrialization as the major objective, which was regarded at the time as critical to increase living standards" (Ocampo and Ros 2011: 3).

This state-led industrialization paradigm, as was called by Cárdenas, Ocampo and Thorp (2000) had three main components: "…macroeconomic policies centered on the management of the balance of payments, industrialization as the engine of growth, and a strong state intervention in various areas of the economy" (Ocampo and Ros 2011: 4).

So, from the great Depression to the 1980s Latin American economies experienced a development strategy that in some cases allows them to generate an industrialization process[32], although of course not a complete one in the sense that developed countries were and are still the industrial center of the world. With respect to the economic performance of the period:

> "…structural changes were more impressive than overall growth…
>
> National accounts for the four largest Latin American countries (Argentina, Brazil, Colombia and Mexico) register growth rates for Gross Domestic Product (GDP) steadier and higher than those of Canada and the USA for 1929 – 1939. Neither the absolute GDP growth nor its level relative to the growth achieved during the 1940s and

developing countries from the 1950's to the 1990's as a result of a combination of the global development cycle that is "partly determined by that of the industrial world countries" (Ocampo and Parra 2006: 21), and country specific factors related particularly with macroeconomic policies.

[32] According to Bresser-Pereira (2011) "In Latin America… …all countries, except for Haiti and perhaps Nicaragua, have completed primitive accumulation, and… …a group of countries, including at least Argentina, Brazil, Mexico, Chile, Uruguay and Costa Rica, have completed their capitalist revolutions and may be considered middle-income countries." (Bresser-Pereira 2011: 109).

> early 1950s, however, are impressive, ranging from around 2% per annum for Argentina and Mexico, to about 4% per annum for the two major coffee countries" (Díaz-Alejandro 1984: 37 - 38).

However, from 1950 to 1980 the Latin American GDP and the GDP per capita grew 5.5% and 2.7% per year on average, respectively, in both cases higher than those registered by the US, 3.6% and 2.2% per year in average respectively (see Ocampo and Ros, 2011).

This Latin American state-led industrialization process was abruptly interrupted by the Debt crisis that was provoked by the Volcker shock at the beginning of the 1980s. From this disruption the Latin American economies changed their development strategy from one based on the orientation of the state to one based in the liberalization of the markets, a receipt described in the Washington Consensus[33] (see Williamson, 1990). However, it was not only this economic disruption that produced a change in the economic program of the Latin American economies, in fact, it was a mix of ideological and economic factors started to work earlier:

> "…its origins are in the mid-1960s-after the military coups in Brazil (1964), Argentina (1967), and Uruguay (1968). The following historical factors contributed to this outcome: (a) the exhaustion of the state-led import substitution strategy; (b) the major foreign debt crisis of the 1980s; (c) the intellectual dominance of the associated-dependency interpretation of Latin America since the early 1970s-an interpretation that dismissed the dualist and peripheral character of Latin American societies; (d) the success of the US

[33] It is worth to note that the Washington Consensus did not cover all the liberalization reforms that were done in the practice by most of the Latin American countries, especially it did not include a full liberalization of the capital account (see Birdsall, de la Torre and Valencia Caicedo, 2011 and Bresser-Pereira, 2011).

> policy (beginning in the late 1960s) of training Latin American economists in doctoral programs in the United States; and (e) the neoliberal wave and, in the academic world, the rise of neoclassical economics, public choice theory, and new institutionalism-three sophisticated attempts to ground neoliberalism scientifically" (Bresser-Pereira 2011: 111).

The Debt crisis resulted in the now called Lost Decade of the 1980s, during that decade the Latin American GDP grew 2.13% per annum in average whilst the GDP per capita grew 0.06% per annum on average. So, the combination of the economic performance and the ideological neoliberal wave gave as a result the change in the development strategy of the region from a "…model of state dirigisme focused on inwardly oriented import substitution industrialization… …towards greater reliance on markets, openness, and export orientation" (Birdsall, de la Torre and Valencia Caicedo 2011: 80)[34].

The new market liberalization strategy has been summarized in the Decalogue of Washington Consensus policies: (a) Fiscal discipline, (b) Re-prioritization of the public expenditure, (c) Tax reform, (d) Positive real interest rates, (e) Competitive exchange rates, (f) Trade Liberalization, (g) Foreign direct investment, (h) Privatization, (i) Deregulation, and (j) Property rights[35]. Although as it was noted previously the Washington Consensus did not cover all the reforms promoted by the policy makers of

[34] It is worth to note as it is indicated by Birdsall, de la Torre and Valencia Caicedo (2011) with respect to the Williamson's paper "What Washington Means By Policy Reform" that whilst his article "…was reflecting his own views, his article constitutes a synthesis of policies already in vogue at the time-in the region as well as in Washington. Indeed, Williamson is better portrayed as a recorder than a creator of the new paradigm…" (Birdsall, de la Torre and Valencia Caicedo 2011: 81).

[35] See Birdsall, de la Torre and Valencia Caicedo (2011) for a full analysis of the Washington Consensus.

the Latin American economies, and even some of the strategies listed in the Decalogue were not implemented as indicated[36].

In the following lines we analyze some of the policies of the Decalogue of Washington Consensus and their impact in the investment coefficient of the Mexican economy[37].

a) Fiscal discipline and re-prioritization of the public expenditure.

In the case of Latin American governments, the adoption of the fiscal discipline implicated a change in the perspective regarding the use of the deficit/surplus public budget as a stabilizer mechanism. The stabilizing role of the fiscal policy works through the automatic stabilizers and through the discretionary part of the fiscal policy itself. The automatic stabilizers are the endogenous variations in the public incomes and expenditures that are a result of variations of the GDP; for example, if the GDP decreases it is also expected that the public incomes be decreased given a tax rate, moreover, if there is an unemployment insurance it is expected that the public expenditure be increased, therefore the decrease of the GDP results in an automatic generation of a public deficit. In addition, fiscal authorities could decrease the average tax rate and increase the public expenditure in a discretionary way in order to generate a stimulus of the aggregate demand.

[36] For example the common appreciation of the real exchange rates resulted from the use of the nominal exchange rate as an anchor of the inflation.

[37] Birdsall, de la Torre and Valencia Caicedo (2011) identify three categories of diagnosis about the economic results produced by the Washington Consensus reform in Latin America: (a) There was nothing wrong with the reform program, but the problem was the faulty implementation of the reform; (b) The reform program was fundamentally flawed and, (c) The program reform was incomplete.

But, whereas during the state-led industrialization period the fiscal policy was widely used as an element of the overall growth strategy, after the debt crisis of the early eighties the policy makers, usually of neoclassical training, replaced the development paradigm by a neoliberal one: "This paradigm [the state-led industrialization paradigm] was replaced during the 1970s in a few countries and the mid-1980s in the rest of the region by another which placed markets and integration into the world economy at the center." (Ocampo and Ros 2011: 3).

But if the change was abrupt in the strict theoretical sense, in the practical sense the policy makers from developing countries went even further: "…procyclical fiscal policy seems to be the norm in the developing world just as fiscal policy is acyclical in the advanced economies." (Kaminsky, Reinhart and Végh 2004: 11).

The procyclical feature of the fiscal policy is destabilizing, because shrinks the demand in crisis times and expands the demand in boom times. The kind of fiscal policy has been identified and analyzed by some authors in the case of Latin America as a whole (see Gavin and Perotti, 1997; Talvi and Végh, 2000; Kaminsky, Reinhart and Végh, 2004; United Nations, 2006 and Cardenas and Perry, 2011 among others) and for the case of Mexico in particular (World Bank, 2001; Pastor and Villagomez, 2007; Cruz and Lapa, 2011 and Ros, 2013 among others).

The radical behavior that the policy makers, of developing countries in general and of Latin America in particular, adopted after the 1980s has been subject to several explanations among which are the following: According to Cardenas and Perry (2011):

> "Most analysts of budgetary processes find that, unless there are strong institutional constraints, political incentives normally lead to greater spending during booms. Such

political incentives exists as long as voters and supporters value the immediate provision of additional goods and services (and campaign financiers value additional contracts), and do not fully understand or punish the potential future effects of such actions. Furthermore, governments may find difficult to impose austerity during a boom after a cut in expenditures during the previous bust." (Cárdenas y Perry 2011: 278)[38].

In the same way, according to the United Nations (2006):

"The pro-cyclical nature of capital flows has also made macroeconomic policies more pro-cyclical. This means that when the economy fares better, international investors are more eager to invest in the country and Governments happily spend more and when the economic weather deteriorates, external financiers are less willing to provide new funding precisely when it is more needed." (United Nations 2006: 92) [39].

Now, we want to evaluate what kind of fiscal policy has been used in México from 1990[40]. In order to do our evaluation, we use a variation of the fiscal impulse methodology used by the IMF and which is explained in World Bank (2001):

"The fiscal impulse measure is based on the so-called cyclical effect of the budget, which is defined as the difference between the actual budget surplus and the budget surplus that would have been achieved in the absence of discretionary policy. In its simplest form, this method treats all movements in government expenditure that are not proportional to trend

[38] See Talvi and Végh (2000) for a formal development of the argument.

[39] See Grabel (1996) for an analysis about the analysis of the loss of autonomy with respect to economic policy that developing countries faced when they depend on portfolio capital inflows.

[40] The available time series published by the Secretary of Finance and Public Credit started in 1990.

output as discretionary. It further treats all changes in revenue because of changes in the average rate at which revenue is raised as discretionary." (World Bank 2001: 22).

The difference with the methodology described above is that we do not use the trend output as a measure of potential output, but rather we use our estimated economic capacity whose estimation methodology is presented in the Appendix A; we assume that given the average annual utilization rate, the potential output is given by the product of *CE* and that corresponding average. The following equations define the relationships to use and the measure of the fiscal stimulus[41]:

$$Y_t^* = (1 + agap_t) * CE_t \qquad (4.1)$$

$$BP_t^d = R_t - raY_t - (GG_t - ggaY_t^*) \qquad (4.2)$$

where Y^* is the potential output, BP^d is the discretionary public balance, R and ra are the public incomes and the average of the public incomes as a percentage of the GDP, and GG and gga are the public expenditures and the average of the public expenditures as a percentage of the GDP.

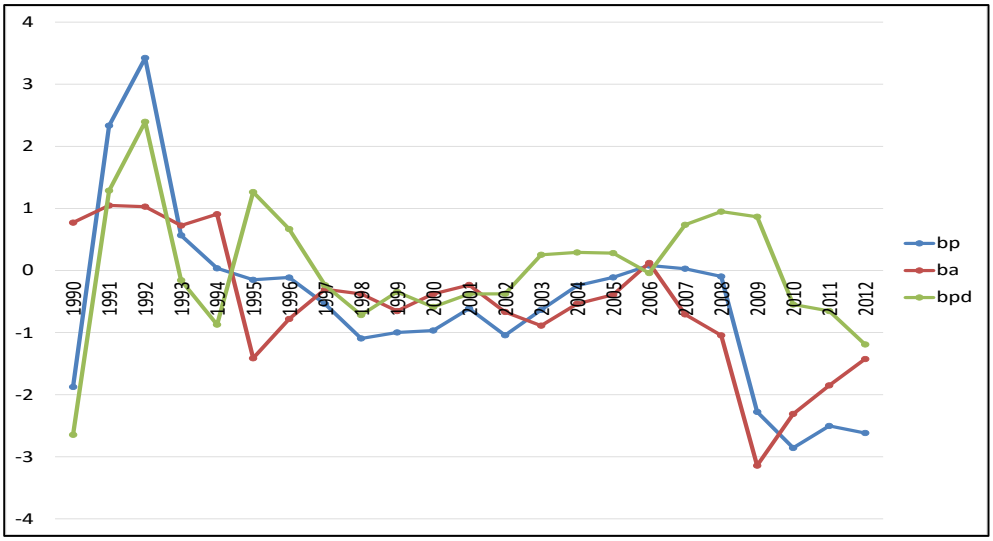
From the methodology about the fiscal impulse previously explained and through the use of averages of six-year periods[42], we present in Figure (4.1) the effective public balance (bp); the public balance that would be occurred if there was not a discretionary policy, it means the automatic public balance (bp^a); and the discretionary public balance

[41] It is worth to note that our methodology, in the same way as the original one, does not have a theoretical justification and we are just using it as a simply proxy in order to evaluate the kind of fiscal policy that has been used in Mexico from 1990.

[42] We take as a reference the six years presidential periods in Mexico.

(bp^d), all of them measured as a percentage of the GDP. As it can be seen, in the case of *bp*, with the exception of the sub-period 1991 – 1994[43], its values are negative; in the same way, in the case of bp^a its values are negatives with the exception of the sub-period 1990 – 1994; lastly, the corresponding values of bp^d fluctuate around zero.

Figure 4.1
Effective (bp), Automatic (bpa) and Discretional (bpd) public balances as a percentage of the GDP, 1990 – 2012.



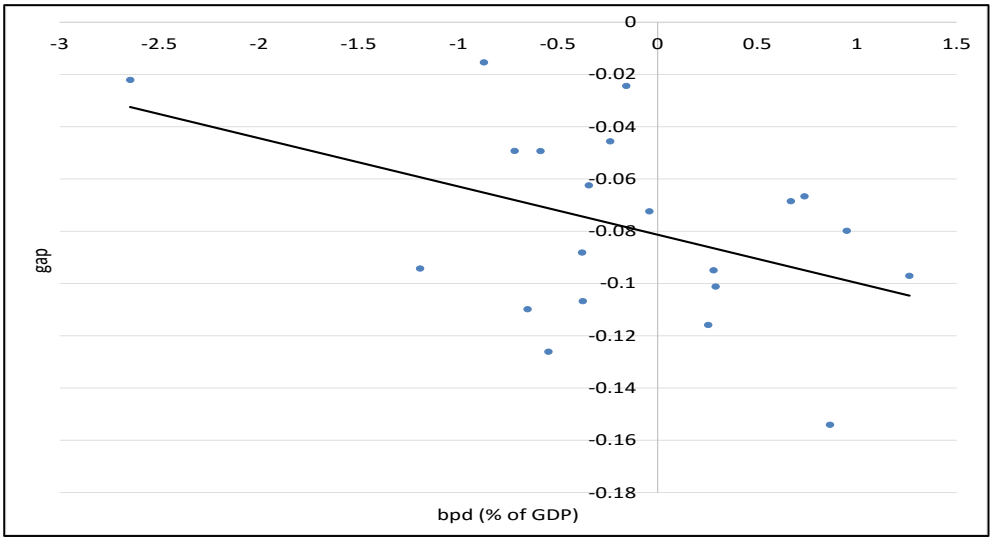
Source: Author's elaboration using data from INEGI and the Secretary of Finance and Public Credit of Mexico.

In the Figure (4.2) is shown the pro-cyclical nature of the discretionary fiscal policy, as it can be seen, if we eliminate the atypical years of 1991 and 1992, there is a negative relationship between the utilization coefficient and the discretionary public balance, it means that the discretionary public balance is increased when the utilization coefficient is decreased. The simple correlation coefficient between bp^d and *gap* is -0.45

[43] It is worth to note that between 1991and 1992 the Mexican Federal Government got a huge quantity of extraordinary public incomes as a result of the selling of many public firms.

and according to a simple regression, the utilization coefficient is equal to -0.08 when the bp^d is zero.

Figure 4.2
Discretional Public balance and Utilization coefficient, 1990, 1993 – 2012.

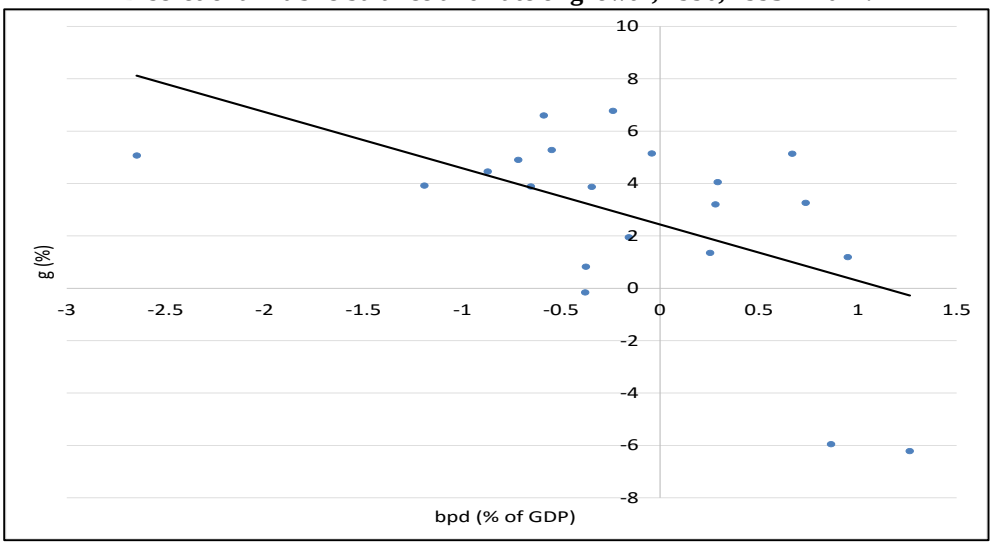


Source: Author's elaboration using data from INEGI, the Secretary of Finance and Public Credit of Mexico, the World Bank and Hofman (2000).

In the same way, according to the Figure 4.3, if we eliminate the atypical years of 1991 and 1992, there is evidence of a pro-cyclical fiscal policy if we relate the discretionary public balance and the rate of growth (g). The relationship between bp^d and g is negative, which means that the bp^d is increased when the rate of growth is decreased. The simple correlation coefficient between bp^d and g is -0.54 and according to a simple regression, the rate of growth is equal to 2.44% when the *bpd* is zero. It is also worth to note that in two of the three years in which the economy showed a negative rate of growth, the bp^d was positive, which means that the aggregate demand of the public sector was reduced in a discretionary way.

Figure 4.3

Discretional Public balance and rate of growth, 1990, 1993 – 2012.



Source: Author's elaboration using data from INEGI and the Secretary of Finance and Public Credit of Mexico.

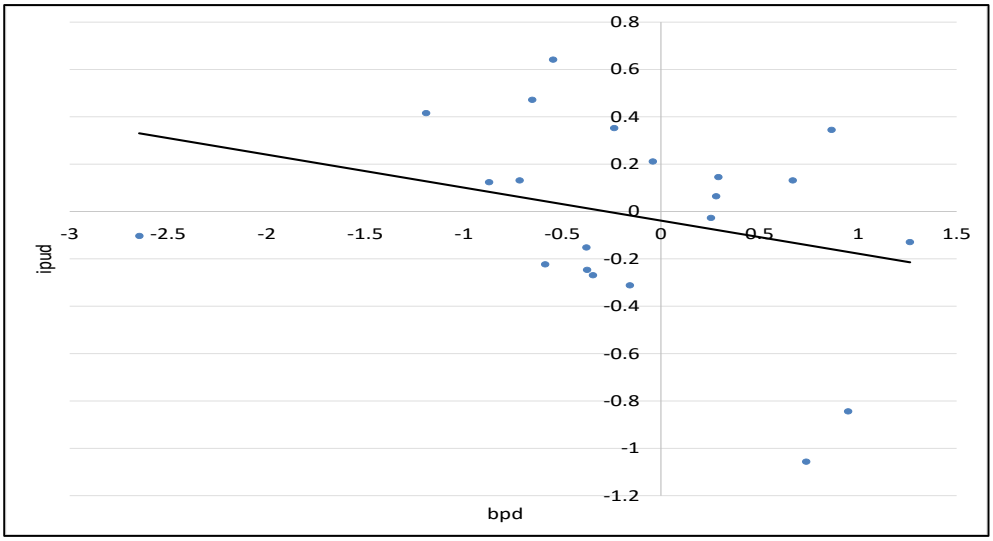
The inability to carry out a tax reform the use of a pro-cyclical fiscal policy not only implies a greater intensification of the economic cycles but also a negative impact on the rate of growth because:

> "…grater social expenditure in Latin America during the last two decades have tended to crowd out expenditures in public infrastructure affecting longer-term output growth… …social expenditures have been constitutionally and legally protected, leaving investment in infrastructure as the more flexible and adaptable component of the budget." (Cárdenas and Perry 2011: 274).

This also seems to be a characteristic of the Mexican economy; as it is shown in the Figure (4.4), if we eliminate the atypical years of 1991 and 1992, the bp^d exhibits a negative relationship with the discretionary public investment measured as a percentage of the GDP (ipu^d); from 1993 to 2012 the simple correlation coefficients between the two

variables is equal to -0.44 which means that when the economy is in a depressive period the discretionary public superavit is hand in hand with a reduction of the discretionary public investment, which obviously negatively affects capital accumulation and therefore the economic growth.

Figure 4.4
Discretional Public balance and discretional public investment (% of GDP), 1990, 1993 – 2012.



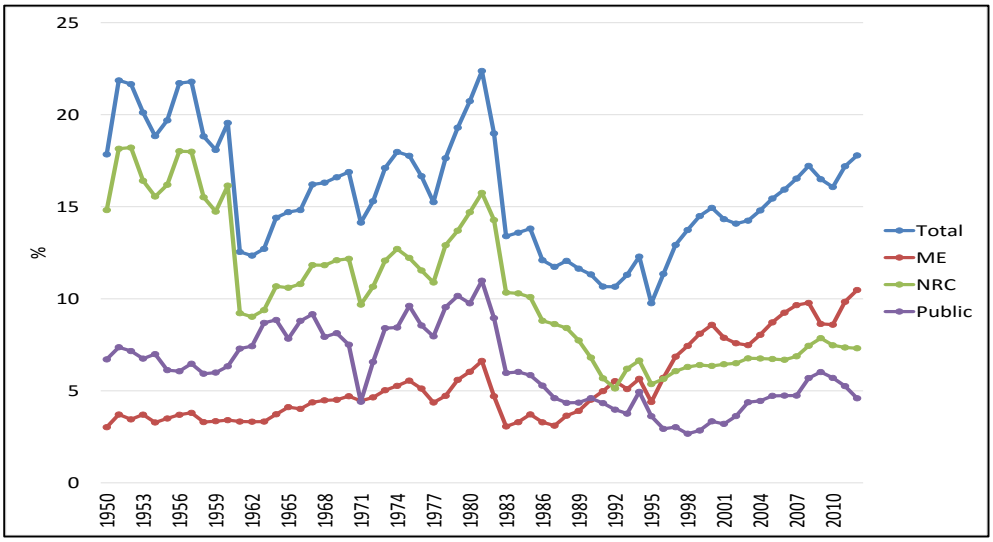
Source: Author's elaboration using data from INEGI and the Secretary of Finance and Public Credit of Mexico.

Moreover, although we do not have enough information to evaluate the kind of fiscal policy that Mexican authorities followed from 1950 to 1989, as it was indicated, the sub-period 1950 - 1981 was part of state-led industrialization period of the Mexican economy in which the fiscal policy, and the public investment in particular was very important in the strategy of industrialization of Mexico. As it can be seen in the Figure (4.5), the total investment coefficient shows a high correlation with the public investment coefficient, mainly through a strong association between the non-residential construction investment coefficient and the public investment coefficient. The strong decrease of the

total investment coefficient after the Debt crisis of 1982 was highly related to a strong decrease of the public investment coefficient. From 1950 to 1981 the annual average of the total, machinery and equipment, non-residential construction and public investment coefficients were equal to 17.56%, 4.24%, 13.32% and 7.75%, respectively, whilst the corresponding values for the sub-period 1982 – 1988 were 13.67%, 3.55%, 10.12% and 5.86%, and for the sub-period 1989 – 2012 the corresponding values were 13.97%, 7.36%, 6.61% and 4.23%.

So, it looks like the fiscal discipline and the reduction of the public investment from the liberalization period have contributed to generate a reduction of the total investment and then of the rate of growth.

Figure 4.5
Total, Machinery and Equipment, Non Residential Construction and Public Investment Coefficients, 1950 – 2012.



Source: Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

b) Trade liberalization and dismantling of the industrial policy.

After the Debt Crisis of 1982, Mexican economy was gradually integrated into the international markets, in 1986 with its incorporation to the General Agreement on Tariffs and Trade (GATT) and in 1994 with the launching of the North American Free Trade Agreement (NAFTA) between Mexico, United States and Canada.

The new development program adopted by Mexico is based on an export-led-growth strategy. According to some authors a policy of openness is a necessary condition for income convergence between countries; others go further assuming that a policy of openness is a sufficient condition for income convergence. The background of this approach can be found for example in the Heckscher-Ohlin international trade model; assuming the existence of two countries, two produced goods, two factors of production (labor and capital), that both countries have access to the same technology of production, which in turn exhibits constant returns to scale and, that internal markets are competitive, it is possible to show that competitive trade openness will result in an equalization of the wages of the workers and of the rates of returns of the capital between both countries (see Ros, 2004)[44]. It is worth to note that:

> "Factor price equalization does not imply the convergence of income or output per worker because factor quantities will still differ across countries. However, factor price equalization will imply a stronger tendency toward convergence of incomes than is present in today's world economy…" (Ros 2004: 235)[45].

[44] Although it is worth to note that factor price equalization is contingent; if the two countries' factor endowment ratios are "far apart", then factor price equalization will not take place.

[45] Own translation.

Of course it can be possible that the assumptions in which the Heckscher-Ohlin model is based are not fulfilled in the reality in which case the equalization of the prices of the factors cannot be assured, for example, if there is increasing returns associated with the capital stock, if countries do not have the same access to the technology, if there is not complete specialization or if some of the factors is not used in the production of one of the produced products (see Ros, 2004).

Trade liberalization also has been supported through empirical studies; Sachs and Werner (1995) find strong evidence about the positive effect of openness for a very large sample of economies; based on statistical and econometric analysis they conclude that they "…have provided strong evidence of convergence among open economies during the period 1970-89, as well as evidence of accelerated growth in the countries that have recently undertaken market reforms." (Sachs and Werner 1995: 63). Even Sachs and Werner go further and they indicate that:

> "…trade policy represent just one element-albeit the most important-of an overall economic policy. Among developing countries, open trade has tended to be correlated with other features of a healthy economy, such as macroeconomic balance and reliance on the private sector as the main engine of growth. To some extent, opening the economy has helped to promote governmental responsibility in other areas." (Sachs and Werner 1995: 63).

However and despite the great enthusiasm exhibited by the author's conclusions about trade openness, in the comments to their paper Stanley Fischer calls the attention about the good economic performance exhibited by African and Latin American

countries in the 1950s and in the 1960s during the import substitution strategy and maybe most important he offers counter examples with respect to two claims offered by Sachs and Werner (1995):

> "The first is that no country that liberalized trade failed to grow. It is not clear how to define the trade regime of the *zone franc* in Africa, but trade with France, at least, was open. Yet these countries failed to grow during much of the 1980s. The second claim is that no country that liberalized subsequently suffered from a macroeconomic crisis. The obvious counterexample here is Mexico; as noted above, Israel is another." (Fischer 1995: 104).

We think that the crucial point with respect to the Mexican case is that the trade liberalization strategy did not result in a specialization on capital intensive production nor in the production of high added value activities. The maquila industry, with its most predominant assembly nature, played a key role from the beginning of the promotion of the exports in the mid-1960s, and nor the adherence to the GATT, nor the adherence to the NAFTA changed this characteristic of the Mexican economy, and as it is explained by Balassa (1989):

> "…experience indicates that a growing part of the expansion of the trade in manufactured goods between the developed countries and the newly-industrializing countries involves intra-industry rather than inter-industry specialization, in which cases changes will occur in the product composition of the firm rather than in the industrial structure of the economy." (Balassa 1989: 1652).

Mexican exporting firms are characterized by a very few number of firms that almost exclusively produce for the export market, "…no more than 300 firms, a majority of them linked to transnational corporations." (Moreno-Brid and Ros 2009: 187); on the other hand:

> "…Mexico´s manufactured exports have become heavily dependent on imports, with rather reduced local content and weak linkages with domestic suppliers. This is true of *maquiladoras*, but also for a substantial proportion of other firms that export manufactures. In fact, about 70% of Mexico's exports of manufactures are produced through assembling processes of imported inputs that enter the country under the preferential tax schemes PITEX [the Spanish acronym of the Temporal Program of Importation in order to produce exporting goods] and ALTEX [the Spanish acronym of the Strongly Exporters Firms program]." (Moreno-Brid and Ros 2009: 189).

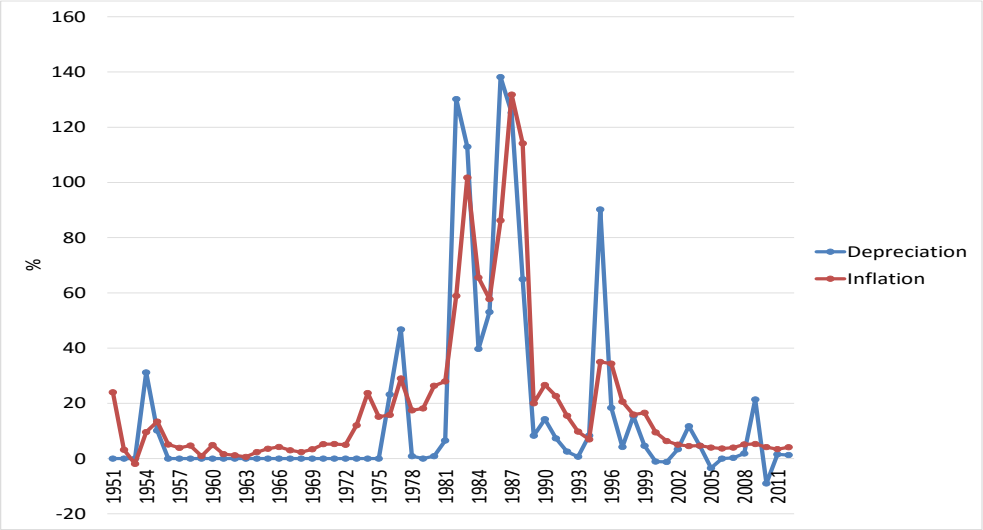
So, the Mexican exporting industry has been characterized by a low added value industry with very weak linkages with the rest of the economy that is not generating investment stimulus. In contrast, during the *Golden Age of Industrialization* the industries producing for the internal market generated strong investment stimulus.

c) Monetary policy and real exchange rate.

As it can be seen in the Figure (4.6), from 1951 to 2012 there has been a high correlation between the annual nominal depreciation of the exchange rate and the annual rate of inflation in Mexico. So, one of the common strategies, explicit or implicit, of the Central Bank has been to stabilize the value of the nominal exchange rate. This strategy has resulted in a permanent appreciation of the real exchange rate (see Figure (4.7)) that

usually has been reversed during each one of the crisis periods. The appreciation of the real exchange rate could be positive for a developing economy as Mexican economy is because it encourages investment through the lower prices of imported capital goods. However an appreciated real exchange rate also could generate a negative effect in the investment process because it could affect in a negative way the profitability of the tradable industries. Ibarra (2008) showed evidence that indicates that the negative effect is higher than the positive effect in the case of Mexico.

Figure 4.6
Annual rates of nominal depreciation of the exchange rate and of the inflation, 1951 – 2012.

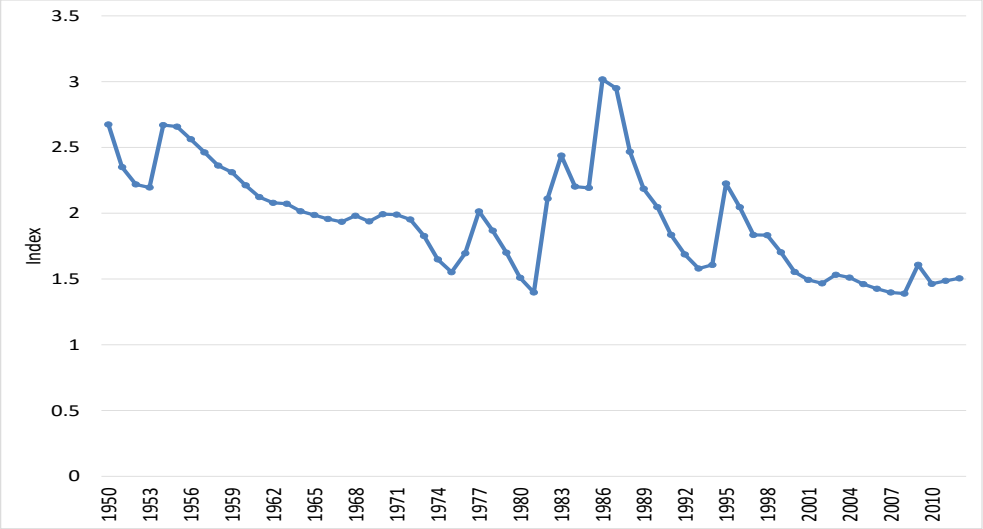


Source: Bank of Mexico.

Now we want to be clear in the sense that the idea about the negative effect of the appreciation of the real exchange rate on the investment is not a contradiction with the reasoning that we followed along the chapters 1 and 2 in which we indicated, following to Thirlwall (1979), that the depreciation of the real exchange rate is not an important strategy in order to increase the rate of growth consistent with a constant trade balance

position. In this subsection we are considering the level of the real exchange rate whilst in chapters 1 and 2 we were considering its rate of variation.

Figure 4.7
Real exchange rate 1950 – 2012.



Source: Author's elaboration using data from the World Penn Table and the Bank of Mexico.

d) Oil and investment boom, annual appreciation of the real exchange rate during the 1970s and the Debt Crisis of 1982.

As it has been indicated, from the Debt Crisis of 1982 the Mexican economy changed from a high to a low investment regime. Now, we claimed on chapter 2 that the main factor behind the strong decrease in the rate of growth consistent with a constant trade balance position was the strong reduction of the investment coefficient and also we claimed that taking into account overlapped periods of 24 years each one we do not observe a clear problem with respect to the trade balance position previous to 1982. However, it is true that there was an external debt problem in the late 1970s and that the trade balance has to do with this phenomenon. From 1978 to 1981 the accumulated annual variation of the trade balance as a percentage of the GDP was equal to -3.56%

whilst the same indicator from 1951 to 1977 was equal to 4.79%, so the improvement reached during 27 years with respect to the trade balance position was almost fully reversed in four years. In the context of our theoretical models developed in our previous chapters, we think that there were two factors that contributed to the worsening of the trade balance position.

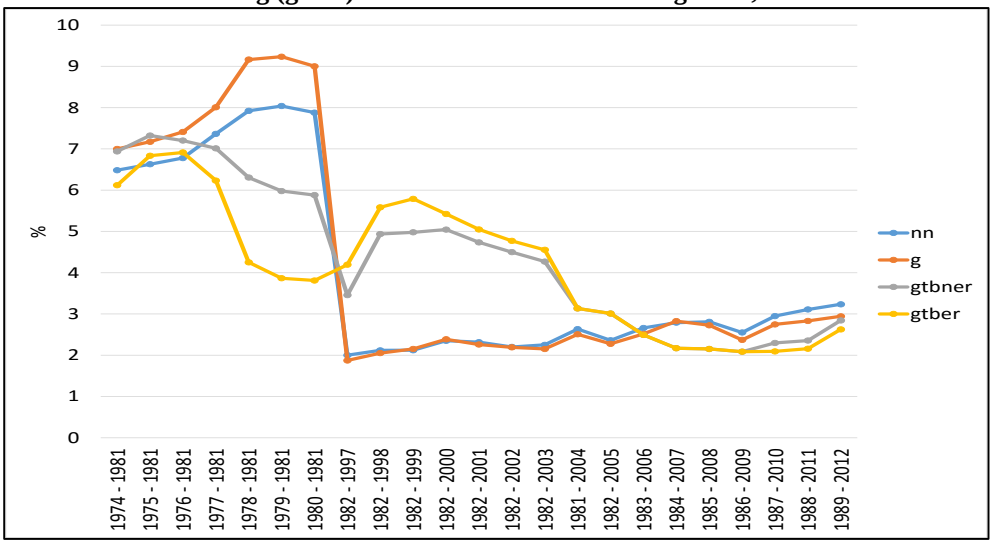
On one hand, the oil boom experimented by the Mexican economy during the late 1970s contributed to generate a strong increase of the total investment coefficient; however, as it is explained by Moreno-Brid and Ros (2009) this investment boom was not registered in the manufacturing sector, but mainly in the services sector, moreover the liberalization of the capital goods imported was initiated from the mid-1970s, so both factors could contribute to the huge increase of the economic capacity elasticity of demand for imports exhibited during the late 1970s (see Chapter 2). On the other hand, whilst the real exchange rate exhibited an accumulated appreciation equal to -24.69% from 1951 to 1977, the same indicator from 1977 to 1981 was equal to -30.62%, moreover during these years and according to our estimations presented in the chapter 2, the real exchange elasticity of the demand for imports was statistically significant (see Chapter 2).

The increase of the economic capacity elasticity of demand for imports and the strong appreciation of the real exchange rate contributed to reduce the rate of growth consistent with a constant trade balance position below the normal natural rate of growth (see Figure (4.8)). The difference between the normal natural rate of growth and the rate of growth consistent with a constant trade balance position was equal to 3.67% from 1978 to 1981 whilst it was equal to 4.17% from 1979 to 1981. It is worth to note that if

the real exchange rate had not appreciated, the difference between the normal natural rate of growth and the rate of growth consistent with a constant trade balance position without considering the annual variation of the real exchange rate (*gtbner*) would have been 2.06% from 1978 to 1981 and 2.00% from 1979 to 1981. So the normal natural rate of growth and then the proper warranted rate of growth of the economy were not in line with the rate of growth consistent with a constant trade balance position which was negatively affected by the economic policy followed by the Mexican policy makers. After the Debt Crisis of 1982 the normal natural rate of growth was strongly decreased below the rate of growth consistent with a constant trade balance position in order to generate positive changes of the trade balance. However, the appreciation of the real exchange rate policy which has still been used after the correction of the trade balance position and the dismantling of the industrialization policy have contributed to maintain a very low value of both the normal natural rate of growth and the rate of growth consistent with a constant trade balance. Moreover, from the sub-period 1983 – 2006 to the sub-period 1989 – 2012 the normal natural rate of growth has been higher than the rate of growth consistent with a constant trade balance which revives the trade balance problems exhibited previously to the Debt Crisis of 1982 but with the important difference that now this problem is hand in hand with a very low effective rate of growth.

Figure 4.8

Normal, Effective, consistent with a constant trade balance position without (gtbner) and considering (gtber) the effect of the real exchange rate, 1974 – 2012.



Author's elaboration using data from INEGI, the World Bank and Hofman (2000).

4.3 Final remarks.

Whilst it is true that the adoption of the neoliberalism paradigm as a strategy to generate growth has not been a unique characteristic of the Mexican economy, it is important to recognize that the results have not been the expected. After the Debt Crisis of 1982 the Mexican economy transited to a low investment regime which was the result among other things of the economic policies and structural changes followed in the context of the liberalization process.

The fiscal policy has been used in a procyclical way which amplifies the economic cycles and leave the public investment as the main source of adjustment. So, the fiscal austerity followed for the Mexican policy makers has been centered in a reduction of the public investment which has resulted in a reduction of the total investment and then of both, the normal natural rate of growth and the rate of growth consistent with a constant trade balance. We think that there is scope for the Mexican

authorities in order to follow a countercyclical policy in order to compensate the economic cycles, moreover, if the public investment is used in a more dynamic way, it is plausible that the private investment also will be stimulated through a crowding in effect and this would generate an increase of both, the normal natural rate of growth and the rate of growth consistent with a constant trade balance.

We are not sure if Mexican economy could cancel or at least to modify the NAFTA, but we are sure that policy makers can reincorporate an industrialization policy in the Mexican economy agenda. If there is a program with the aim of industrialize to the Mexican economy, it could result in an increase of the high added value industries and also with the generation of greater linkage between the national industries.

The real exchange rate has to be competitive, the constant appreciation of the real exchange rate has facilitated the investment through the generation of low prices of the capital goods imported, but also has had a negative effect on the profitability of the tradable industries. Given the context of the NAFTA, the real exchange rate could be a viable instrument in order to promote the internal production.

Finally, the Mexican economy is reviving a kind of situation like the experimented previously to the Debt Crisis of 1982, the rate of growth consistent with a constant trade balance position is lower than the normal natural rate of growth, but with the difference that now the effective rate of growth is very low, it is necessary to increase the rate of growth consistent with a constant trade balance position over the normal natural rate of growth and it can be possible through an increase of the public investment, a depreciation of the real exchange rate, the re-installation of an industrial policy and the use of annual depreciations of the real exchange rate between other policies.

APPENDIX A.

DETERMINATION OF THE ECONOMIC CAPACITY FOR THE MEXICAN ECONOMY.

-Theoretical framework.

In this section we show the way in which we calculated the Economic Capacity (*CE*) of the Mexican Economy for the period 1950 – 2012.

Shaikh and Moudud (2004) developed a methodology in order to determine the Economic Capacity. As a first step they elaborated a theoretical framework in order to determine an equation of the Economic Capacity to be estimated.

Shaikh and Moudud (2004) established an identity equation:

$$Y_t \equiv \frac{Y_t}{CE_t} \cdot \frac{CE_t}{K_t} \cdot K_t \qquad \text{(A.1)}$$

where K_t is the capital stock at time t. Taking logarithms of equation (A.1) we get:

$$\log Y_t = \log K_t - \log \kappa_t + \mu_t \qquad \text{(A.2)}$$

where κ is the capital-capacity ratio, and μ is the capacity utilization rate (Y_t/CE_t). Now, Shaikh and Moudud (2004) assume that output fluctuates around capacity over the long-run, so that the actual rate of capacity utilization (μ_t) fluctuates around some desired or normal rate of capacity utilization ($\mu^*=1$). So they define the following equation:

$$\log \mu_t = \upsilon_{\mu t} \qquad \text{(A.3)}$$

where $\upsilon_{\mu t}$ is a random error term. In the case of the capital-capacity ratio it is assumed that this ratio change over time, partly due to an autonomous technical change, and partly due to embodied technical change that, itself, depends on the rate of capital accumulation:

$$\log \kappa_t = \log A + a_1 t + a_2 \log K_t + \upsilon_{\kappa t} \qquad \text{(A.4)}$$

where A is a constant, a_1 is the autonomous rate of technological change, t represents time, a_2 is the elasticity of κ with respect to K, and $\upsilon_{\kappa t}$ is an error term. Substituting (A.3) and (A.4) in (A.2) we get:

$$\log Y_t = -\log A - a_1 t + (1 - a_2) \log K_t + \upsilon_{\mu t} + \upsilon_{\kappa t} \qquad \text{(A.5)}$$

We can rewrite (A.5) as:

$$\log Y_t = \Pi_0 + \Pi_1 \log K_t + \Pi_2 t + \upsilon_t \qquad \text{(A.6)}$$

where Π_0 is equal to $\log A$, Π_1 is equal to $(1\text{-}a_2)$, Π_2 is equal to $-a_1$, and υ_t is equal to $\upsilon_{\mu t} + \upsilon_{\kappa t}$. So, Shaikh and Moudud (2004) indicate that equation (A.6) can be estimated by the cointegration method in order to get the Economic Capacity.

In our estimation of the Economic Capacity we want to introduce a different equation for the capital-capacity ratio because we think that this ratio does not only

depend of the aggregate capital, but also depends on the composition of the aggregate capital, so we postulate the following equation:

$$\log \kappa_t = \log B + b_1 \log K_t - b_2 \log ME_t - b_3 \log CO_t + \upsilon_{\kappa t}^2 \qquad \text{(A.7)}$$

where *B* is a constant, *ME* is the machinery and equipment capital stock, *CO* is the non-residential construction capital stock, b_1 is the elasticity of the ratio capital-capacity to the capital stock, b_2 is the elasticity of the ratio capital-capacity to the machinery and equipment capital stock, and b_3 is the elasticity of the ratio capital-capacity to the non-residential construction capital stock. Substituting (A.3) and (A.7) in (A.2) we get:

$$\log Y_t = -\log B + (1 - b_1) \log K_t + b_2 \log ME_t + b_3 \log CO_t + \upsilon_{\mu t} + \upsilon_{\kappa t}^2 \qquad \text{(A.8)}$$

We can rewrite (A.5) as:

$$\log Y_t = \Pi_3 + \Pi_4 \log ME_t + \Pi_5 CO_t + \Pi_6 \log K_t + \upsilon_t^2 \qquad \text{(A.9)}$$

where Π_3 is equal to *logB*, Π_4 is equal to b_2, Π_5 is equal to b_3, Π_6 is equal to $(1-b_1)$, and υ_t^2 is equal to $\upsilon_{\mu t} + \upsilon_{\kappa t}^2$. So, we can estimate the equation (A.6) by the cointegration method in order to get the Economic Capacity. Before we do that, let us say some characteristics of equation (A.9), although it is true that there is a multicollinearity problem, it is not big problem given the fact that although $K_t = ME_t + CO_t$, we are using the variables in logarithmic terms; on the other hand, we are not interested in the strict

relationships between *CE* and *ME*, between *CE* and *CO*, or between *CE* and *K* but we are interested in the estimation of *CE*; moreover, with this specification, we can show that the change in the composition of the capital stock can affect the relationship between *CE* and *K*. If anti-logarithms of equation (A.9) we get:

$$CE_t = \frac{\Pi_3 ME^{\Pi_4} CO^{\Pi_5}}{K^{\Pi_6}} \qquad \text{(A.10)}$$

If we take the elasticity of *CE* with respect to *ME/CO* we get:

$$e_{CE,ME} = \Pi_4 - \Pi_6 \frac{ME_t}{K_t} \qquad \text{(A.11)}$$

and

$$e_{CE,CO} = \Pi_5 - \Pi_6 \frac{CO_t}{K_t} \qquad \text{(A.12)}$$

So, the elasticities of *CE* with respect to *ME* and *CO* depend on the composition of the capital stock.

- Estimation of the Economic Capacity for the Mexican case.

As a first step for the estimation of the Economic Capacity for the Mexican case we evaluate the integration order of the *GDP*, *ME*, *CO* and *K* series, all in logarithmic terms.

Table A.1 Unit root tests for the determinants of the economic capacity.

Variable	ADF test	Lags included[a]	PP test	Bandwidths included[b]	Perron test (structural break)	Strucural break period	Lags included[a]
GDP	-0.76	0	-0.82	2			
d(GDP)	-5.62*	0	-5.62*	2			
ME	-2.28	3	-2.22	5			
d(ME)	-2.22	2	-2.63***	4	-5.68**	1981	5
CO	-0.66	8	-1.49	5			
d(CO)	-2.28	5	-2.07	1	-6.48*	1977	5
K	-1.01	6	-1.96	5			
d(K)	-2.49	5	-2.33	3	-5.76*	1977	6

*Statistically significant at the 1% level.
**Statistically significant at the 5% level.
***Statistically significant at the 10% level.
Source: Author's elaboration using data from INEGI and Hofman (2000).
Note: All the capital stock series were elaborated through the Perpetual Inventory Method using data from Hofman (2000), ECLAC and INEGI.
All series are in logarithmic terms. d(Z) means the first differences of the variable Z.
All level tests were done assuming the existence of intercept and trend.
All first differences tests were don assuming the existence of intercept.
[a]The number of lags included was based on the Schwarz Information Criterion.
[b]Optimal bandwidth based on Newey-West criterion.
All Perron tests were done assuming a structural break in both intercept and trend.

As it can be seen in the Table A.1, all series, *GDP*, *ME*, *CO* and *K* are I(1). Now, we use the bound test approach to cointegration (see Peasaran, Shin and Smith, 2001). So, first, we run an unrestricted error correction model, the estimated results are presented in the Table A.2.

Now, we get the F-statistics for the null hypothesis that all the parameters corresponding to the dependent and independent variables in levels in table A.2 are equal to zero and we compare that value with the critical value reported in Peasaran, Shin and Smith (2001) for the case of cointegration relationship with unrestricted intercept and no trend. As it can be seen in table A.3 we can accept the existence of a cointegration relationship between the GDP and *ME*, *CO* and *K* given that the F – statistics computed is higher than the upper critical value.

Table A.2 Estimation of the long run determinants of the Economic Capacity.

Dependent variable: $d(GDP_t)$		
Independent variable	Coefficient	t - statistics
Constant	5.18*	5.67
GDP_{t-1}	-0.75*	-5.47
ME_{t-1}	0.86*	5.64
CO_{t-1}	1.87*	5.33
K_{t-1}	-2.11*	-5.08
$d(GDP_{t-1})$	0.13	0.96
$d(GDP_{t-2})$	0.51*	4.07
$d(GDP_{t-3})$	0.29*	2.77
$d(GDP_{t-4})$	0.33*	4.45
$d(ME_t)$	2.99*	7.97
$d(ME_{t-1})$	-2.39*	-5.35
$d(ME_{t-2})$	1.04**	2.38
$d(ME_{t-3})$	-0.57**	-2.31
$d(CO_t)$	3.45*	3.01
$d(K_t)$	-3.36**	-2.30
$d(K_{t-1})$	-1.24*	-2.78
D55	0.06*	3.64
D09	-0.05	-3.59
R^2	0.93	
Jarque-Bera test	0.32	
LM test (one lag included)	0.02	
White test	1.08	
Ramsey Reset test (one fitted term included)	1.99	

*Statistically significant at the 1% level.
**Statistically significant at the 5% level.
Source: Author's elaboration using data from INEGI and Hofman (2000).
Note: All series are in logarithmic terms. d(Z) means the first differences of the variable Z. D?? means a dummy variable with value equal to one for the year 19?? or for the year 20??.

Table A.3
Bound cointegration test for the case of restricted intercept and no trend.

F statistics	Lower critical value (1%)	Upper critical value (1%)
11.66	3.65	4.66

Source: Author's elaboration using data from INEGI and Hofman (2000).
Note: Critical values were taken from Peasaran, Shin and Smith (2001).

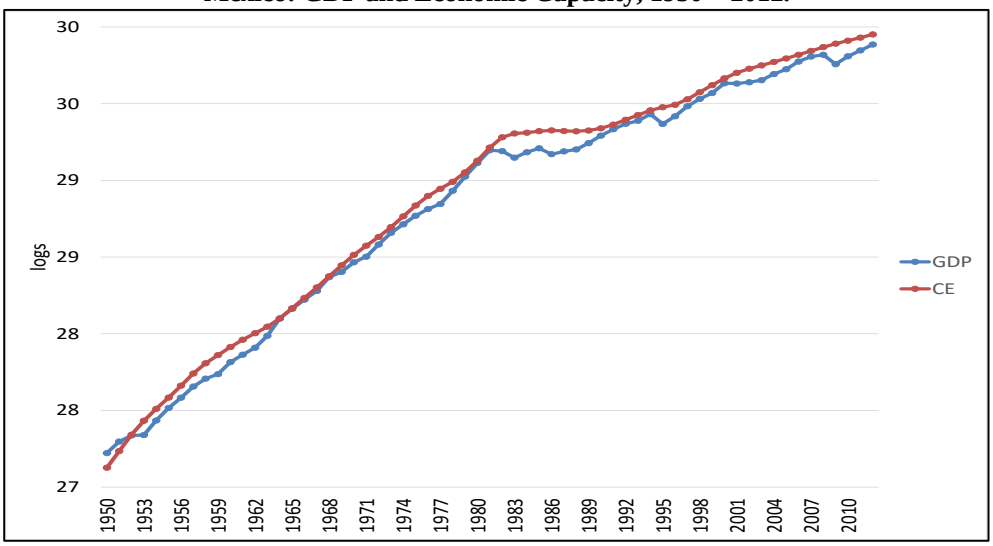
Given our previous results we can postulate the long-run equation determining the economic capacity of the Mexican case for the period 1950 – 2012 as:

$$\log Y_t = 6.93 + 1.15 ME_t + 2.50 \log CO_t - 2.82 K_t \qquad \text{(A.13)}$$

We can assume that the GDP was equal to the economic capacity in the year with the maximum rate of growth of the GDP and then we use this reference point and the estimated values of $logY_t$ in order to generate a complete series for the economic capacity. In the Figure A.1 we show the GDP and the estimated Economic Capacity for the case of Mexico for the period 1950 – 2012.

Figure A.1

Mexico: GDP and Economic Capacity, 1950 – 2012.



Source: Author's elaboration using data from INEGI and Hofman (2000).

APPENDIX B.

STATISTICAL TESTS FOR THE ROLLING REGRESSIONS OF THE IMPORT DEMAND EQUATION.

In table B.1 we present the unit root tests for *m*, *ce*, *di-ce*, and *x-ce*.

Table B.1 Unit root test for the rate of growth of the imports and its determinants.

Variable	Sub-period	ADF test	Lags included[a]	PP test	Bandwidths included[b]
m	1951 - 1974	-2.51	4	-9.51*	5
m	1952 - 1975	-2.92***	4	-8.17*	5
m	1953 - 1976	-2.08***	4	-7.44*	3
m	1954 - 1977	-2.34	4	-5.42*	0
m	1955 - 1978	-3.88*	4	-5.07*	3
m	1956 - 1979	-4.14*	4	-5.51*	2
m	1957 - 1980	-4.19*	4	-5.55*	0
m	1958 - 1981	-4.77*	4	-5.36*	1
m	1959 - 1982	-5.22*	4	-3.24**	1
m	1960 - 1983	-5.12*	4	-4.63*	0
m	1961 - 1984	-6.26*	4	-3.50**	5
m	1962 - 1985	-5.93*	4	-6.10*	7
m	1963 - 1986	-4.67*	4	-6.44*	11
m	1964 - 1987	-5.27*	4	-7.67*	13
m	1965 - 1988	-4.69*	2	-4.98*	12
m	1966 - 1989	-5.29*	1	-8.96*	21
m	1967 - 1990	-5.16*	1	-8.99*	21
m	1968 - 1991	-5.16*	1	-9.16*	19
m	1969 - 1992	-5.16*	1	-8.96*	20
m	1970- 1993	-5.07*	1	-8.30*	18
m	1971 - 1994	-4.52*	4	-9.04*	20
m	1972 - 1995	-4.90*	0	-6.29*	10
m	1973 - 1996	-4.90*	2	-8.46*	10
m	1974 - 1997	-4.95*	2	-8.73*	9
m	1975 - 1998	-4.92*	2	-9.21*	11
m	1976 - 1999	-4.82*	2	-12.68*	17
m	1977 - 2000	-5.63*	0	-11.16*	16
m	1978 - 2001	-5.63*	0	-8.49*	9
m	1979 - 2002	-4.69*	2	-13.99*	23
m	1980 - 2003	-5.79*	0	-11.95*	23
m	1981 - 2004	-5.81*	0	-8.51*	14
m	1982 - 2005	-4.82*	2	-12.92*	23
m	1983 - 2006	-6.74*	1	-13.22*	23
m	1984 - 2007	-4.99*	4	-7.83*	8
m	1985 - 2008	-5.48*	2	-19.79*	16
m	1986 - 2009	-7.78*	0	-12.96*	7
m	1987 - 2010	-5.22*	1	-11.25*	5
m	1988 - 2011	-8.71*	0	-12.10*	5
m	1989 - 2012	-10.48*	0	-25.28*	14
$\hat{\theta}$	1951 - 1974	-6.03*	0	-7.78*	7

Table B.1 continues…					
$\hat{\theta}$	1952 - 1975	-6.23*	0	-8.75*	8
$\hat{\theta}$	1953 - 1976	-5.56*	0	-6.42*	6
$\hat{\theta}$	1954 - 1977	-5.24*	0	-5.28*	2
$\hat{\theta}$	1955 - 1978	-6.13*	1	-6.75*	4
$\hat{\theta}$	1956 - 1979	-4.83*	1	-8.89*	11
$\hat{\theta}$	1957 - 1980	-4.89*	0	-6.19*	8
$\hat{\theta}$	1958 - 1981	-4.88*	0	-6.60*	8
$\hat{\theta}$	1959 - 1982	-4.93*	3	-2.09	1
$\hat{\theta}$	1960 - 1983	-11.57*	3	-6.82*	3
$\hat{\theta}$	1961 - 1984	-12.98*	3	-10.90*	23
$\hat{\theta}$	1962 - 1985	-13.36*	3	-13.66*	23
$\hat{\theta}$	1963 - 1986	-5.91*	3	-7.21*	23
$\hat{\theta}$	1964 - 1987	-5.10*	4	-11.66*	13
$\hat{\theta}$	1965 - 1988	-5.73*	2	-9.67*	14
$\hat{\theta}$	1966 - 1989	-5.62*	2	-10.01*	13
$\hat{\theta}$	1967 - 1990	-5.51*	2	-10.82*	13
$\hat{\theta}$	1968 - 1991	-5.50*	2	-10.55*	13
$\hat{\theta}$	1969 - 1992	-5.49*	2	-10.71*	13
$\hat{\theta}$	1970- 1993	-5.47*	2	-10.82*	13
$\hat{\theta}$	1971 - 1994	-5.44*	2	-11.20*	13
$\hat{\theta}$	1972 - 1995	-5.53*	1	-7.86*	23
$\hat{\theta}$	1973 - 1996	-5.24*	2	-11.91*	16
$\hat{\theta}$	1974 - 1997	-5.26*	2	-12.09*	16
$\hat{\theta}$	1975 - 1998	-5.28*	2	-11.12*	14
$\hat{\theta}$	1976 - 1999	-6.18*	1	-11.41*	14
$\hat{\theta}$	1977 - 2000	-6.25*	1	-12.53*	13
$\hat{\theta}$	1978 - 2001	-6.44*	1	-12.48*	15
$\hat{\theta}$	1979 - 2002	-5.11*	2	-14.52*	12
$\hat{\theta}$	1980 - 2003	-6.23*	1	-12.64*	12
$\hat{\theta}$	1981 - 2004	-6.38*	1	-11.18*	13
$\hat{\theta}$	1982 - 2005	-6.37*	1	-12.94*	12
$\hat{\theta}$	1983 - 2006	-8.30*	1	-12.91*	23
$\hat{\theta}$	1984 - 2007	-5.89*	2	-10.48*	11
$\hat{\theta}$	1985 - 2008	-5.78*	2	-18.79*	23
$\hat{\theta}$	1986 - 2009	-5.55*	2	-13.96*	23
$\hat{\theta}$	1987 - 2010	-4.66*	2	-8.38*	5
$\hat{\theta}$	1988 - 2011	-5.79*	1	-17.94*	23
$\hat{\theta}$	1989 - 2012	-6.16*	1	-20.05*	23
ce	1951 - 1974	-4.38*	0	-4.38*	1
ce	1952 - 1975	-4.51*	0	-4.51*	1
ce	1953 - 1976	-4.61*	0	-4.60*	1
ce	1954 - 1977	-4.48*	0	-4.48*	0
ce	1955 - 1978	-4.99*	0	-5.00*	1

Table B.1 continues…					
ce	1956 - 1979	-4.69*	0	-4.69*	1
ce	1957 - 1980	-4.17*	0	-4.17*	0
ce	1958 - 1981	-4.04*	0	-4.04*	1
ce	1959 - 1982	-4.26*	0	-4.22*	2
ce	1960 - 1983	-3.83*	2	-2.66***	0
ce	1961 - 1984	-4.02*	2	-3.14**	0
ce	1962 - 1985	-4.70*	2	-3.45**	1
ce	1963 - 1986	-3.44**	0	-3.48**	1
ce	1964 - 1987	-3.41**	0	-3.44**	1
ce	1965 - 1988	-3.83*	0	-3.86*	2
ce	1966 - 1989	-3.03**	0	-2.94***	3
ce	1967 - 1990	-2.81***	0	-2.72***	3
ce	1968 - 1991	-4.33*	1	-2.43	3
ce	1969 - 1992	-4.67*	1	-2.49	3
ce	1970- 1993	-4.77*	1	-2.53	3
ce	1971 - 1994	-4.65*	1	-2.52	3
ce	1972 - 1995	-4.55*	1	-2.54	3
ce	1973 - 1996	-4.55*	1	-2.59	3
ce	1974 - 1997	-4.41*	1	-2.40	3
ce	1975 - 1998	-4.54*	1	-2.58	3
ce	1976 - 1999	-4.52*	1	-2.62	3
ce	1977 - 2000	-4.47*	1	-2.49	4
ce	1978 - 2001	-4.55*	1	-2.97***	2
ce	1979 - 2002	-4.34*	1	-2.56	3
ce	1980 - 2003	-4.28*	1	-2.65***	4
ce	1981 - 2004	-4.28*	1	-2.88***	3
ce	1982 - 2005	-4.44*	1	-3.02**	2
ce	1983 - 2006	-4.19*	1	-2.48	11
ce	1984 - 2007	-3.74*	3	-4.97*	3
ce	1985 - 2008	-4.31*	1	-3.81*	2
ce	1986 - 2009	-3.13**	1	-2.95***	2
ce	1987 - 2010	-2.77***	0	-2.83***	2
ce	1988 - 2011	-3.79*	1	-3.14**	1
ce	1989 - 2012	-3.96*	3	-2.77***	2
di-ce	1951 - 1974	-6.45*	0	-8.54*	13
di-ce	1952 - 1975	-6.61*	0	-8.34*	11
di-ce	1953 - 1976	-6.74*	0	-8.28*	10
di-ce	1954 - 1977	-6.90*	0	-7.52*	5
di-ce	1955 - 1978	-7.47*	0	-11.90*	11
di-ce	1956 - 1979	-6.89*	0	-9.36*	8
di-ce	1957 - 1980	-6.76*	0	-16.36*	23
di-ce	1958 - 1981	-6.67*	0	-15.07*	16
di-ce	1959 - 1982	-5.50*	0	-5.52*	2
di-ce	1960 - 1983	-6.15*	0	-6.22*	2
di-ce	1961 - 1984	-4.55*	1	-6.13*	8
di-ce	1962 - 1985	-5.39*	0	-7.13*	6
di-ce	1963 - 1986	-5.43*	1	-9.24*	23
di-ce	1964 - 1987	-5.78*	1	-10.95*	23
di-ce	1965 - 1988	-5.81*	1	-9.93*	23
di-ce	1966 - 1989	-5.29*	1	-11.08*	23
di-ce	1967 - 1990	-5.42*	1	-12.82*	23
di-ce	1968 - 1991	-5.44*	1	-14.44*	23

Table B.1 continues…					
di-ce	1969 - 1992	-5.34*	1	-13.34*	22
di-ce	1970- 1993	-5.22*	1	-11.79*	23
di-ce	1971 - 1994	-5.20*	1	-12.72*	23
di-ce	1972 - 1995	-4.74*	0	-4.64*	7
di-ce	1973 - 1996	-6.41*	0	-9.37*	9
di-ce	1974 - 1997	-5.13*	1	-13.28*	12
di-ce	1975 - 1998	-5.54*	1	-16.89*	23
di-ce	1976 - 1999	-5.50*	1	-15.42*	23
di-ce	1977 - 2000	-5.60*	1	-15.96*	23
di-ce	1978 - 2001	-5.60*	1	-15.87*	23
di-ce	1979 - 2002	-5.75*	1	-17.19*	23
di-ce	1980 - 2003	-5.75*	1	-15.06*	23
di-ce	1981 - 2004	-5.64*	1	-16.37*	23
di-ce	1982 - 2005	-5.67*	1	-15.59*	17
di-ce	1983 - 2006	-6.47*	1	-14.90*	23
di-ce	1984 - 2007	-6.56*	1	-11.98*	23
di-ce	1985 - 2008	-6.33*	1	-23.63*	23
di-ce	1986 - 2009	-6.49*	1	-16.67*	16
di-ce	1987 - 2010	-5.79*	1	-13.75*	10
di-ce	1988 - 2011	-7.51*	0	-19.43*	23
di-ce	1989 - 2012	-7.29*	0	-13.65*	21
x-ce	1951 - 1974	-8.88*	1	-8.44*	8
x-ce	1952 - 1975	-9.08*	1	-10.29*	9
x-ce	1953 - 1976	-9.32*	1	-10.80*	9
x-ce	1954 - 1977	-8.63*	1	-8.04*	15
x-ce	1955 - 1978	-10.55*	1	-7.93*	14
x-ce	1956 - 1979	-10.25*	1	-6.51*	23
x-ce	1957 - 1980	-8.64*	1	-10.79*	12
x-ce	1958 - 1981	-7.29*	1	-9.05*	23
x-ce	1959 - 1982	-6.28*	1	-11.61*	23
x-ce	1960 - 1983	-6.00*	1	-11.19*	23
x-ce	1961 - 1984	-5.88*	1	-13.43*	23
x-ce	1962 - 1985	-4.85*	1	-6.39*	11
x-ce	1963 - 1986	-5.34*	1	-10.56*	23
x-ce	1964 - 1987	-5.27*	1	-11.86*	23
x-ce	1965 - 1988	-5.44*	1	-11.80*	23
x-ce	1966 - 1989	-5.43*	1	-11.49*	23
x-ce	1967 - 1990	-5.38*	1	-11.05*	23
x-ce	1968 - 1991	-5.74*	1	-7.82*	10
x-ce	1969 - 1992	-5.28*	1	-7.20*	13
x-ce	1970- 1993	-5.26*	1	-8.01*	9
x-ce	1971 - 1994	-4.57*	1	-5.63*	6
x-ce	1972 - 1995	-4.37*	0	-4.29*	3
x-ce	1973 - 1996	-5.03*	0	-5.17*	3
x-ce	1974 - 1997	-4.81*	2	-4.54*	4
x-ce	1975 - 1998	-5.01*	2	-5.22*	4
x-ce	1976 - 1999	-4.63*	0	-4.79*	4
x-ce	1977 - 2000	-4.68*	2	-5.34*	6
x-ce	1978 - 2001	-4.85*	0	-5.09*	6
x-ce	1979 - 2002	-5.79*	0	-6.63*	6
x-ce	1980 - 2003	-5.67*	0	-7.69*	10
x-ce	1981 - 2004	-5.12*	2	-6.63*	7

Table B.1 continues…					
x-ce	1982 - 2005	-5.46*	2	-7.09*	6
x-ce	1983 - 2006	-4.95*	2	-5.97*	4
x-ce	1984 - 2007	-5.01*	2	-5.57*	5
x-ce	1985 - 2008	-5.04*	2	-5.71*	5
x-ce	1986 - 2009	-4.48*	2	-4.93*	1
x-ce	1987 - 2010	-4.65*	2	-4.58*	5
x-ce	1988 - 2011	-6.91*	0	-8.66*	5
x-ce	1989 - 2012	-6.79*	0	-12.87*	10

*Statistically significant at the 1% level.
**Statistically significant at the 5% level.
***Statistically significant at the 10% level.
Source: Author's elaboration using data from INEGI, ECLAC, World Penn Table and Hofman (2000).
Note: All series are in rate of growths terms.
All level tests were done assuming the existence of intercept except in the case of $\hat{\theta}$ in which we do not assume the existence of intercept.
All first differences tests were don assuming the existence of intercept.
[a]The number of lags included was based on the Schwarz Information Criterion.
[b]Optimal bandwidth based on Newey-West criterion.

In table B.2 we present the econometric results of the estimation of equation (2.1).

Table B.2 Estimations of the rate of growth of the imports of Mexico.

Dependent variable: *m*													
1951 - 1974							$\hat{\theta}$	*ce*	*di - ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.72**	0.94*	1.64*		1.22	1.19	4.50[a]
t – statistics							(-2.66)	(4.98)	(5.08)				
1952 - 1975							$\hat{\theta}$	*ce*	*di - ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.46**	0.79*	1.76*		1.17	1.14	3.42[b]
t – statistics							(-2.51)	(4.93)	(5.67)				
1953 - 1976							$\hat{\theta}$	*ce*	*di - ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.50**	0.78*	1.74*		1.12	1.48	3.47[b]
t – statistics							(-2.77)	(4.45)	(5.00)				
1954 - 1977							$\hat{\theta}$	*ce*	*di - ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.64*	0.70*	2.24*		1.50	1.37	2.82[b]
t – statistics							(-3.50)	(3.60)	(4.72)				
1955 - 1978							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.84*	0.64*	2.22*		0.92	1.13	1.89
t – statistics							(-3.53)	(3.14)	(3.84)				

Table B.2 continues…													
1956 - 1979							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.92*	0.68*	2.42*		1.22	1.52	1.69
t – statistics							(-3.69)	(3.08)	(4.01)				
1957 - 1980							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-1.14*	0.61**	2.13*	0.44**	0.45	1.36	1.52
t – statistics							(-4.72)	(2.69)	(3.43)	(2.46)			
1958 - 1981							$\hat{\theta}$	*ce*	*di – ce*	*x – ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-1.15*	0.63**	2.10*	0.45**	0.55	1.63	1.12
t – statistics							(-4.83)	(2.67)	(3.37)	(2.33)			
1959 - 1982							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.85*	0.83*	1.69*	0.57**	0.51	1.26	2.76[b]
t – statistics							(-5.06)	(4.47)	(3.49)	(2.82)			
1960 - 1983							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.83*	0.91*	2.09*	0.47**	0.57	0.28	2.45[c]
t – statistics							(-4.01)	(4.51)	(3.23)	(2.20)			
1961 - 1984							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.80*	0.97*	2.26*	0.43***	0.55	0.11	2.32[c]
t – statistics							(-3.82)	(4.76)	(3.52)	(2.01)			

Table B.2 continues…													
1962 - 1985							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.80*	1.03*	2.34*	0.42***	0.59	0.01	2.22[c]
t – statistics							(-3.85)	(5.04)	(3.78)	(2.07)			
1963 - 1986	D86						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	31.57*						-0.80*	1.06*	2.33*	0.43**	0.37	0.00	1.82
t – statistics	(3.94)						(-5.10)	(4.50)	(4.04)	(2.37)			
1964 - 1987	D86						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	31.22*						-0.78*	1.10*	2.40*	0.38**	0.48	0.00	1.64
t – statistics	(3.87)						(-4.75)	(4.53)	(3.88)	(2.18)			
1965 - 1988	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.59*	19.99**					-0.71*	1.21*	2.78*	0.35***	0.43	0.00	1.37
t – statistics	(3.81)	(2.72)					(-4.10)	(4.65)	(3.97)	(1.95)			
1966 - 1989	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.30*	20.30**					-0.70*	1.27*	2.83*	0.33***	0.31	0.02	1.24
t – statistics	(3.89)	(2.84)					(-4.11)	(4.88)	(4.15)	(1.93)			
1967 - 1990	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.31*	20.32**					-0.69*	1.27*	2.88*	0.33***	0.28	0.02	1.30
t – statistics	(3.88)	(2.84)					(-4.07)	(4.81)	(4.31)	(1.94)			

Table B.2 continues…													
1968 - 1991	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	29.05*	23.97*					-0.58*	1.54*	3.23*		2.11	0.19	0.83
t – statistics	(3.65)	(3.39)					(-3.62)	(5.93)	(4.93)				
1969 - 1992	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	29.08*	24.22*					-0.55*	1.75*	3.46*		1.65	0.43	0.68
t – statistics	(3.73)	(3.49)					(-3.46)	(6.42)	(5.16)				
1970 - 1993	D86	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	29.02*	24.27*					-0.55*	1.75*	3.48*		1.70	0.48	0.78
t – statistics	(3.73)	(3.50)					(-3.40)	(6.34)	(5.05)				
1971 - 1994	D77	D86	D88				$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-14.02***	27.77*	21.17**				-0.60*	1.58*	3.20*	0.41***	0.51	0.52	1.30[d]
t – statistics	(-1.80)	(3.25)	(2.69)				(-2.93)	(4.11)	(3.90)	(1.94)			
1972 - 1995	D77	D86	D88	D95			$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-13.94***	27.86*	21.37**	36.83*			-0.60**	1.66*	3.13*	0.38	0.28	0.77	0.91[d]
t – statistics	(-1.76)	(3.22)	(2.67)	(3.17)			(-2.92)	(4.08)	(3.74)	(1.73)			

Table B.2 continues…													
1973 - 1996	D77	D78	D86	D88	D95		$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-16.83**	-14.88***	28.12*	19.96**	36.22*		-0.57*	1.75*	3.61*	0.59*	0.21	1.59	0.53[d]
t – statistics	(-2.23)	(-1.88)	(3.49)	(2.71)	(3.40)		(-3.01)	(4.50)	(4.35)	(3.02)			
1974 - 1997	D77	D78	D86	D88	D95		$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-16.87**	-14.94***	28.12*	19.99**	36.31*		-0.57*	1.76*	3.62*	0.59*	0.19	1.40	0.59[d]
t – statistics	(-2.24)	(-1.89)	(3.50)	(2.72)	(3.40)		(-3.01)	(4.34)	(4.33)	(3.03)			
1975 - 1998	D76	D77	D78	D82	D83	D88	$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-13.27**	-35.18*	-18.44**	-38.34*	-24.44*	27.47*		2.13*	3.34*	0.98*	1.17	0.17	0.32[d]
t – statistics	(-2.14)	(-5.91)	(-2.80)	(-5.79)	(-3.92)	(4.72)		(5.94)	(9.03)	(6.08)			
1976 - 1999	D76	D77	D78	D82	D83	D88	$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-18.14*	-36.11*	-16.33**	-42.24*	-25.67*	29.48*		2.79*	3.02*	0.77*	1.19	0.21	0.84[d]
t – statistics	(-3.23)	(-6.90)	(-2.79)	(-7.25)	(4.69)	(5.71)		(7.64)	(9.19)	(4.86)			
1977 - 2000	D77	D78	D81	D82	D83	D88	$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-37.29*	-16.04*	-13.23**	-45.01*	-26.01*	30.78*		3.40*	2.91*	0.63*	4.33	0.15	0.32
t – statistics	(-8.39)	(-3.23)	(-2.50)	(-8.97)	(-5.60)	(6.96)		(8.91)	(10.32)	(4.31)			

Table B.2 continues…													
1978 - 2001	D78	D81	D82	D83	D88		$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-16.36*	-12.70**	-44.68*	-25.93*	30.54*			3.33*	2.95*	0.66*	3.66	0.18	0.30[d]
t – statistics	(-3.45)	(-2.59)	(-9.33)	(-5.75)	(7.20)			(10.40)	(11.47)	(5.40)			
1979 - 2002	D81	D82	D83	D88			$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-12.62**	-44.63*	-25.91*	30.51*				3.32*	2.95*	0.66*	3.49	0.18	0.30[d]
t – statistics	(-2.67)	(-9.66)	(-5.93)	(7.42)				(11.05)	(12.03)	(5.74)			
1980 - 2003	D81	D82	D83	D88			$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-14.07**	-44.74*	-25.33*	29.96*				3.47*	3.16*	0.72*	0.68	1.29	0.37[d]
t – statistics	(-3.52)	(-11.57)	(-6.90)	(8.69)				(13.51)	(14.65)	(7.40)			
1981 - 2004	D81	D82	D83	D88			$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-14.94*	-45.09*	-25.25*	29.91*				3.57*	3.21*	0.73*	0.92	1.09	0.37[d]
t – statistics	(-3.68)	(-11.79)	(-7.01)	(8.83)				(12.87)	(14.63)	(7.60)			
1982 – 2005	D82	D83	D88				$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-44.98*	-25.23*	29.91*					3.55*	3.20*	0.73*	0.62	0.99	0.46
t – statistics	(-12.04)	(-7.16)	(9.03)					(13.24)	(14.95)	(7.76)			

Table B.2 continues…													
1983 - 2006	D83	D88					$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	-25.22*	30.03*						3.52*	3.17*	0.71*	0.17	0.66	0.50
t – statistics	(-7.12)	(9.02)						(13.13)	(14.87)	(7.65)			
1984 - 2007	D88						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.01*							3.48*	3.16*	0.71*	0.05	0.31	0.50
t – statistics	(9.05)							(13.21)	(14.89)	(7.69)			
1985 - 2008	D88						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.18*							3.46*	3.11*	0.70*	0.02	0.29	0.37
t – statistics	(9.27)							(13.77)	(14.36)	(7.56)			
1986 - 2009	D88						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	30.13*							3.42*	3.07*	0.71*	0.47	1.68	0.34
t – statistics	(9.78)							(14.63)	(16.08)	(9.56)			
1987 - 2010	D88						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	26.32*						-0.25***	2.91*	2.41*	0.76*	1.86	1.86	0.32
t – statistics	(6.93)						(-1.76)	(7.75)	(5.31)	(10.17)			

Table B.2 continues…													
1988 - 2011	D88						$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	25.89*						-0.26***	2.82*	2.42*	0.79*	3.47	2.86	0.39
t – statistics	(7.31)						(-2.01)	(8.29)	(5.83)	(10.86)			
1989 - 2012							$\hat{\theta}$	*ce*	*di – ce*	*x - ce*	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient							-0.36**	2.55*	2.08*	0.78*	2.37	2.19	0.50
t – statistics							(-2.78)	(7.46)	(5.02)	(9.91)			

*Statistically significant at the 1% level.
**Statistically significant at the 5% level.
***Statistically significant at the 10% level.
Source: Author's elaboration using data from INEGI, ECLAC, World Penn Table and Hofman (2000).
LM autocorrelation test included one lag.
White heteroscedasticity test included cross terms.
White heteroscedasticity-consistent standard errors and covariance were used when necessary.
[a]Homocedasticity was rejected at the 1% level.
[b]Homocedasticity was rejected at the 5% level.
[c] Homocedasticity was rejected at the 10% level.
[d]Does not include cross terms in the White heteroscedasticity test.

APPENDIX C.

STATISTICAL TESTS FOR THE ROLLING REGRESSIONS OF THE RATE OF GROWTH EQUATION.

In table C.1 we present the econometric results of the estimation of equation (3.20).

Table C.1 Estimations of the rate of growth of Mexico.

Dependent variable: *g*								
1974 – 1997	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.04*	-3.82*	46.84*	-0.08*	0.91	0.08	0.04	3.79[b]
t – statistics	(15.83)	(-8.26)	(5.43)	(-6.25)				
1975 – 1998	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.21*	-3.90*	47.30*	-0.08*	0.91	0.20	0.11	4.32[a]
t – statistics	(15.84)	(-8.45)	(5.41)	(-6.34)				
1976 – 1999	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.24*	-3.94*	47.24*	-0.08*	0.91	0.20	0.08	4.19[a]
t – statistics	(15.53)	(-7.98)	(5.38)	(-6.47)				
1977 – 2000	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.50*	-4.00*	47.42*	-0.08*	0.88	0.23	0.06	1.30
t – statistics	(12.00)	(-5.13)	(5.65)	(-6.40)				
1978 – 2001	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.42*	-3.87*	47.94*	-0.08*	0.89	0.21	0.07	0.86
t – statistics	(12.25)	(-4.34)	(5.51)	(-6.38)				
1979 – 2002	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	9.11*	-3.44*	50.10*	-0.08*	0.88	0.51	0.01	0.72
t – statistics	(10.12)	(-3.42)	(5.91)	(-6.46)				
1980 – 2003	Constant	*DU*	*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	8.68*	-3.12**	46.36*	-0.08*	0.84	0.25	0.04	1.11
t – statistics	(7.25)	(-2.38)	(5.04)	(-5.56)				

Table C.1 continues…								
1981 – 2004	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	6.02*		48.09*	-0.07*	0.71	0.89	0.15	1.22
t – statistics	(7.02)		(4.46)	(-4.31)				
1982 – 2005	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.52*		42.82*	-0.07*	0.71	0.70	0.56	1.72
t – statistics	(6.51)		(4.15)	(-4.75)				
1983 – 2006	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.79*		42.82*	-0.07*	0.66	0.53	0.74	1.85
t – statistics	(6.43)		(3.88)	(-4.18)				
1984 – 2007	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.83*		43.47*	-0.07*	0.59	0.74	0.67	2.74[c]
t – statistics	(7.97)		(3.59)	(-3.09)				
1985 – 2008	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.94*		45.54*	-0.07*	0.60	0.82	0.96	2.38[c]
t – statistics	(7.75)		(3.62)	(-3.07)				
1986 – 2009	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	6.46*		54.80*	-0.07*	0.66	1.31	1.48	2.39[c]
t – statistics	(7.61)		(4.25)	(-3.40)				
1987 – 2010	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.78*		39.72**	-0.07*	0.55	0.59	1.02	5.24[a]
t – statistics	(6.21)		(2.44)	(-3.36)				
1988 – 2011	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.64*		35.42**	-0.08*	0.56	0.15	0.95	6.16[a]
t – statistics	(5.96)		(2.12)	(-3.76)				

Table C.1 continues…								
1989 – 2012	Constant		*gap*	*u*	R^2	Jarque Bera test	LM test (F - Statistics)	White test (F - Statistics)
Coefficient	5.63*		33.42***	-0.08*	0.55	0.24	1.25	6.76[a]
t – statistics	(5.85)		(1.97)	(-3.81)				

*Statistically significant at the 1% level.
**Statistically significant at the 5% level.
***Statistically significant at the 10% level.
Source: Author's elaboration using data from INEGI, ECLAC, World Penn Table and Hofman (2000).
LM autocorrelation test included one lag.
White heteroscedasticity test included cross terms.
White heteroscedasticity-consistent standard errors and covariance were used when necessary.
[a]Homocedasticity was rejected at the 1% level.
[b]Homocedasticity was rejected at the 5% level.
[c]Homocedasticity was rejected at the 10% level.

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